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VOL. XXX. PART 9

The JOURNAL of AGRICULTURE

Of The Department

VICTORIA AUSTRALIA

SEPTEMBER 1932 Price 3d.

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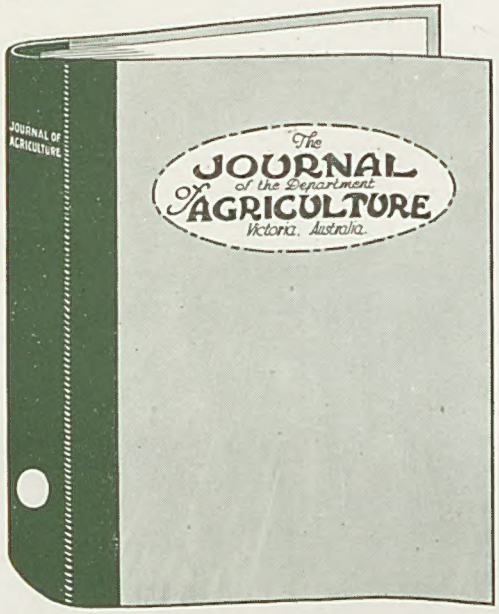

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Issued under the direction of the Hon. J. Allan, M.L.A., Minister of Agriculture.

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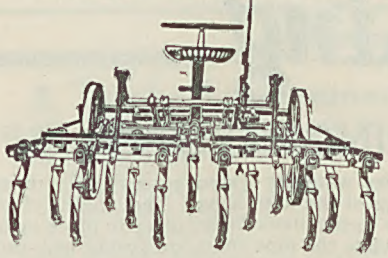

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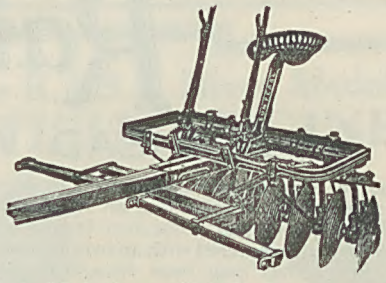

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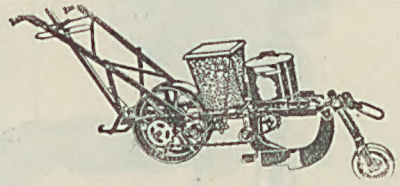

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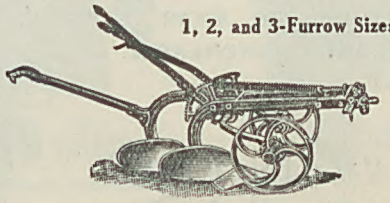

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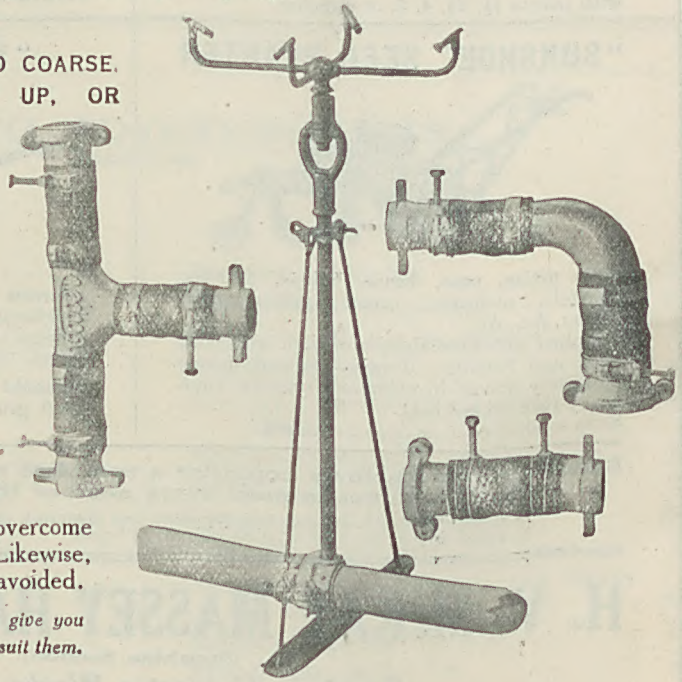

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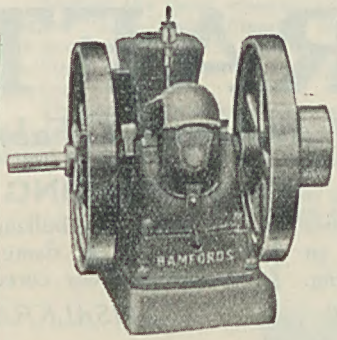

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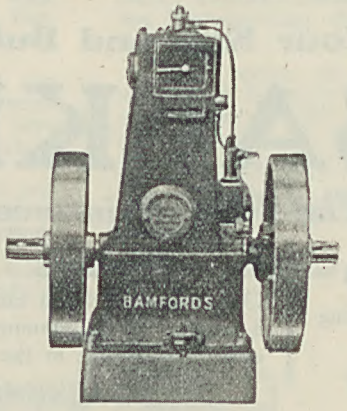

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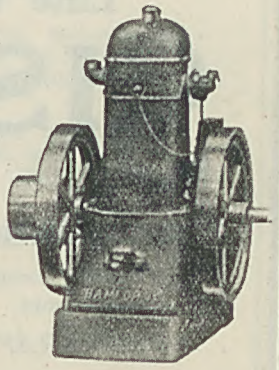

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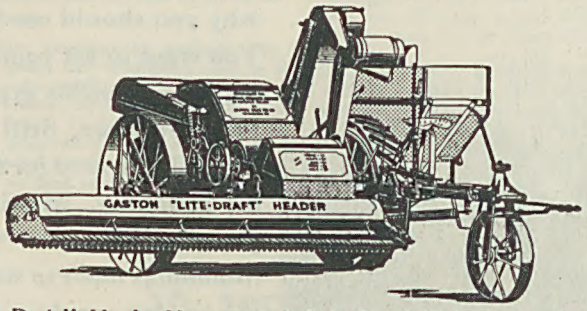

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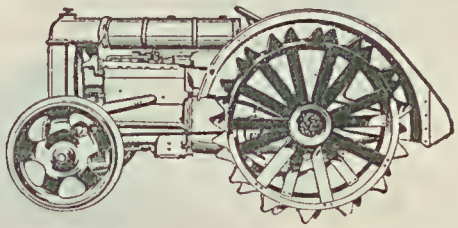

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The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

Standard Herd Test

Report for the Year 1931-32

By A. J. Gill, Senior Herd Tester.

IT is now twenty years since the Government Herd Test was inaugurated, and during that time probably no year has been more favorable for dairying than that which closed on the 30th June last. Certainly some districts experienced an excessively wet winter, but this was followed by a genial spring with pastures that remained fresh and green during the early summer. Then, after a very dry spell of six weeks, heavy rain fell early in February, followed by frequent falls, with the result that there was an abundance of rich autumn feed. In the northern parts of the State there is still plenty of grass 18 inches long, forming a cover for the young feed. This luxuriant growth gives some idea of the productivity of the State if in some way our summer rainfall could be increased or if irrigation water could be made available.

Last season's great supply of feed is reflected in the increased output of dairy produce, but as one views the acres and acres of old grass bleached and dried in the sun, one cannot help wondering how many tons of good fodder have gone to waste and how many tons of butter, beef, and mutton are lost through our failure to store what nature provided. Years of plenty are followed by lean seasons, but we go on our way hoping that each bad year will be the last. Our people are slow to realize that fodder saved is money saved, but it is pleasing to note that with the increase in testing there is an increase in the storing of fodder.

Testing makes dairying more interesting, and thus makes for better work on the farm. The results have turned the thoughts of the farmer towards breeding and feeding. He realizes that if yields of butter-fat are to be increased, he must breed better stock, which if they are to give the full return they are capable of must be given ample food for sustenance and milk production.

The introduction of the Standard Herd Test marked a change in the history of dairy-farming in Victoria. It proved the superiority of pure-bred animals, and showed what could be accomplished by careful selection and mating. The great improvement in the pure-bred herds has been followed by a similar improvement in the ordinary commercial herds, and high-producing grades are replacing the low yielding scrub cows of a few years ago. Truly, the founders of the Standard Herd Test "builded better than they knew."

The achievement of this year's winning herd is a good example of what can be attained by steady and careful work, and the owners, Messrs. D. Cameron and Sons, are to be congratulated. It is eight years since the Studleigh herd first competed in the test. At that time it consisted of two cows only. The number was gradually increased, chiefly by the progeny of the best three cows that testing revealed. There are now nine "Harebells" in the herd, all of them descendants of the famous Harebell of Springhurst. In the order of merit for last season one will find

The Champion Cow—Mr. W. K. Atkinson's Milking Shorthorn, Willow Park Fairy, 745 lb. butter-fat.

the names of two daughters of Harebell—full sisters—and each at the head of its respective class.

Like a previous winner—Mr. P. J. Maloney, of Tongala—Messrs. Cameron and Sons bred from a small number of good cows. Though not on irrigated country they have a small paddock of lucerne on river flats and also two red clover paddocks. They do not overfeed nor waste concentrates, but have studied the science of feeding carefully, and know the value of good pasture. Last year Messrs. Cameron's herd occupied seventh place; this year it secured first place after quite an exciting competition with last year's champion herd—that of Mr. Enders, who on this occasion has gained second honours. Mr. Enders' herd average without allowance is one to be proud of, and one that it will be very hard to beat.

Third place is filled by Mr. J. D. Read, of Springhurst. The average of his mature cows is a meritorious one, and this herd is one of the three whose averages exceeded 500 lb. of butter-fat.

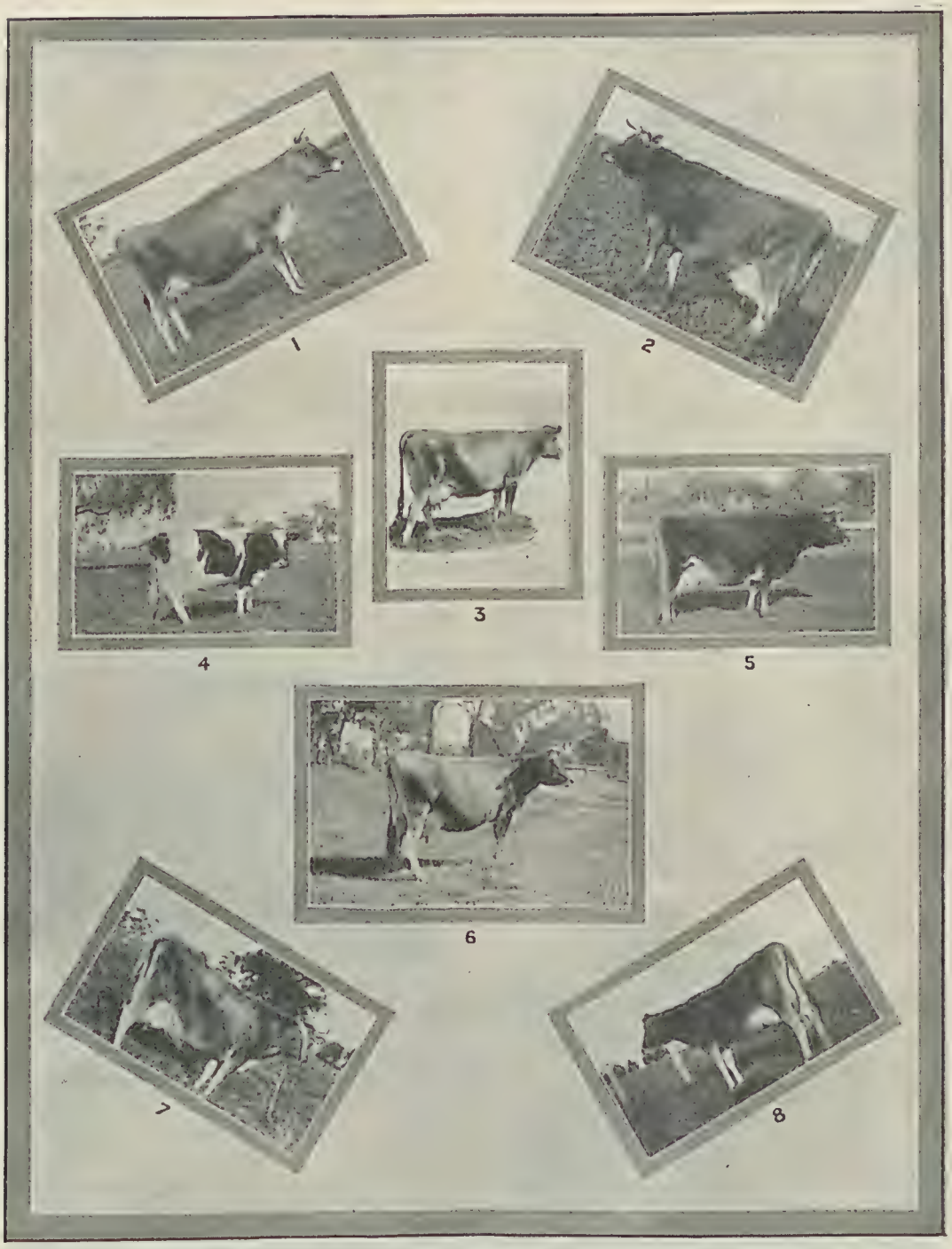
Fourth place goes to Mr. Gordon Lyon's stud—a fine performance for a herd comprising 33 entries. Mr. Lyon's herd was the first to be tested twenty years ago, and from that time there has been a steady improvement. The success of his cows under test and in the show ring marks Mr. Lyon as one of the great Jersey breeders of our day.

Messrs. Cameron & Sons' senior two-year-old Jersey, Studleigh Harebell 3rd, 582 lb. butter-fat.

Messrs. D. Cameron & Sons' senior three-year-old Jersey, Studleigh Harebell 2nd, 596 lb. butter-fat.

In comparing herd averages for this year with those for past years, it must be remembered that the allowances this year have been considerably reduced.

The champion cow for 1931-32 is Mr. Atkinson's Willow Park Fairy, a daughter of last years' champion and grand champion of Victoria. This is the second time that Fairy has been awarded the championship. The Willow Park herd is a fine example of the value of a good sire, and it would be very hard to estimate in terms of money what Havelock of Darbalara has been worth to Mr. Atkinson.



1. *W. T. Jephson's junior 2-yr.-old Jersey, "Elanora Orchid," 521 lb. butter-fat; 2. N. C. De la Rue's mature Jersey, "Lucerne Vale Viscount's Noble Queen," 619 lb. butter-fat; 3. J. D. Read's mature Jersey, "Nardoo of Springhurst," 618 lb. butter-fat; 4. J. Plattfuss's mature Friesian, "Glen Elgin Jessie Segis," 663 lb. butter-fat; 5. F. Bidgood's junior 4-yr.-old Jersey, "Staghorn Master's Fancy 2nd," 542 lb. butter fat; 6. J. D. Read's mature Jersey, "Narcissus of Springhurst," 622 lb. butter-fat; 7. N. H. Enders' mature Jersey "The Wattle's Lizzie Birt," 604 lb. butter-fat; 8. K. McGarvie's junior 3-yr.-old Jersey, "Greenwood Belvidera," 639 lb. butter-fat.*

Mr. C. Nathan's senior four-year-old Jersey, Werribee Day Starbright, 578 lb. butter-fat.

The reserve champion is a Friesian cow, Glen Elgin Jessie Segis, owned by Mr. J. Plattfuss, of Tongala, a well-known breeder.

An interesting feature is the production by Greenwood Belvidera, a junior three-year old Jersey, of 638.62 lb. butter-fat in nine months. The sire of this cow was bred by Mr. K. McGarvie, and sold to a young breeder. The buyer, however, was dissatisfied and returned him. Mr. McGarvie was of a different opinion, and before re-selling him used him on the Greenwood herd. There are a large number of dairymen to-day who would be glad to purchase him, but like many other good bulls he has somehow been lost trace of.

The number of new entrants shows that interest is increasing. This, of course, means additional clerical work, and consequently the preparation of quarterly returns has been delayed.

A very interesting feature of the test is the higher percentage of butter-fat yielded by the milk of all breeds during seasons when there is a plentiful supply of green grass. This year the tests have been high throughout. In dry seasons they are noticeably lower; this suggests that some necessary constituent is lacking in dry grass and fodder.

Messrs. T. M. Noble & Sons' mature Jersey, Wompine Duchess, 633 lb. butter-fat.

Leading Cows in various Sections.

Mature Class—
Willow Park Fairy, 745.45 lb. butter-fat.

Senior 4—
Werribee Day Starbright, 578.02 lb. butter-fat.

Junior 4—
Staghorn Master's Fancy 2nd., 542.02 lb. butter-fat.

Senior 3—
Studleigh Harebell 2nd, 596.18 lb. butter-fat.

Junior 3—
Greenwood Belvidera, 638.62 lb. butter-fat.

Senior 2—
Studleigh Harebell 3rd., 582.44 lb. butter-fat.

Junior 2—
Elanora Orchid 2nd, 521.15 lb. butter-fat.

Mr. J. V. M. Wood's mature Jersey, Werribee Fancy Madeira, 626 lb. butter-fat.

Special Herd Testing Prizes.

The Champion Herd prize of £20, and the Reserve Champion Herd prize of £10 are awarded to the herds giving the greatest and second greatest average under the herd-testing regulations of the Department of Agriculture during the year ending 30th June. The number of cows (completing the test during the year in a herd) must not be less than ten, and the herd must average not less than 300 lb. of butter-fat.

Handicaps are allowed on the following scales:—In a herd of more than ten, each cow

receives an allowance equivalent to ½ lb. of butter-fat for each cow in the herd. Allowances according to class are:—Junior two-year-old, 120 lb.; senior two-year-old, 100 lb. Junior three-year-old, 80 lb.; senior three-year-old, 60 lb. Junior four-year-old, 40 lb.; senior four-year-old, 20 lb.

The three best cows in the winning herd are to be exhibited at the Royal Agricultural show of that year.

The champion Herd prize has been won by Messrs. Cameron and Sons' Jersey herd. The prize for Reserve Champion Herd goes to N. Enders's Jersey herd.

The Grand Champion prize of £100 awarded to the cow securing the position of Annual Champion for three years, not necessarily in succession, was not won.

The prize of £10 for the annual Champion Cow, under Herd Test regulations, is awarded to the cow yielding the greatest amount of butter-fat during a lactation period terminating within the year ending on the 30th of June, under the Department of Agriculture's Standard Herd Test regulations and calving again within fifteen months from previous calving date, being exhibited at the Royal Show. If two lactations are completed within the year the last will be considered. The prize this year was won by Mr. W. K. Atkinson's milking shorthorn cow, Willow Park Fairy, 745.45 lb. of butter-fat.

The Annual Reserve Champion Cow was Mr. J. Plattfus' cow, Glen Elgin Jessie Segis, 663.08 lb. of butter-fat.

The following new entries were accepted during the year:—

Allan, A., Tynong, Jersey. Allen, F. De Vere, Toora, Jersey. Bazeley Bros., Tatura, Jersey. Brock, R. L., Trafalgar, Jersey. Bott, J. and N., Yarrawonga, Red Poll. Boyes, C., Leneva West, Jersey. Bowkett Bros., Heskett, Dairy Shorthorn. Caldwell, J., Glen Alvie, Jersey. Cantwell Bros., Nerrina East, Jersey. Combridge, L. H., Almurta, Jersey. Coughlin, E., Walwa, Jersey. Davies, J. W., Coalville, Jersey. Dowel, L. G., Jumbunna, Jersey. Dowie, A. F., Carisbrook, Jersey. Downie Bros., Longwarry South, Ayrshire. Findlay, G., Leitchville, Jersey. Harrison, F. T., and Son, Moondarra, Jersey. Haywood, Dr. A. R., Hastings, Jersey. Henderson, R., and Son, Macorna, Ayrshire. Hercus, T. B., Hayanmi, Jersey. Itzerott Bros., Heathcote, Jersey. Jenkins, T. C., Tongala, Jersey. Kurrle, J. G., Korumburra, Ayrshire. Le Noury, E., Werribee, Guernsey. Lockett, C. and R., Ballarat, Jersey. McLeish, H. F., Kernot, Jersey. O'Neill, J., Echuca, Jersey. Parker Bros., Seymour, Ayrshire. Pollard, C. F., Bonegilla, Jersey. Poynton and Son, Macarthur, Jersey. Purss, F. W., Walwa, Jersey. Ralph, A. and R., Moorabbin South, Milking Shorthorn. Rankin, W. J., Trafalgar, Jersey. Rhodda, W. G., Warracknabeal, Jersey. Ronalds, Tarago, Jersey. Schmidt, R., Kerang, Jersey. Schreenan Bros., Sebastopol, Ayrshire. Selwyn-Scott, O., Scottsburn, Milking Shorthorn. Shallard, F. A., Undera, Jersey. Smith, W., Trafalgar, Jersey. Wade, W. J., Stratford, Jersey. Waddell, H. M., Longwarry, Jersey. Warner and McKenzie, Toora, Jersey. Williams, F. A., Bamawn East, Jersey. Xavier College, Kew, Jersey.

The Department of Agriculture's Friesian, Victoria Lean Patch, 592 lb. butter-fat.

Herds in Order of Merit

Owner.	Breed.	Junior 2-year-old.		Senior 2-year-old.		Junior 3-year-old.		Senior 3-year-old.		Junior 4-year-old.		Senior 4-year-old.		Mature.		Total Herd.	Average without allowances.	Average with allowances.
		No.	Average.	No.	Average.	No.	Average.	No.	Average.	No.	Average.	No.	Average.	No.	Average.	No.		
1. D. Cameron and Sons	Jersey ..	5	392·35	1	582·[illegible]	..	..	3	476·49	1	486·52	..	..	..	..	10	446·02	538·02
2. N. H. Enders ..	,, ..	10	390·79	1	429·54	1	519·38	2	494·73	1	500·28	1	437·35	6	519·06	22	449·51	531·42
3. J. D. Read ..	,, ..	5	335·92	5	381·87	1	348·92	1	413·12	1	519·30	1	354·27	7	575·22	21	440·53	512·94
4. C. Gordon Lyon	,, ..	13	356·27	3	361·70	3	418·95	4	441·87	1	451·43	3	498·66	6	452·06	33	406·08	496·52
5. R. M. Chirnside	,, ..	10	354·49	..	..	1	438·58	1	423·87	2	438·60	1	444·07	4	498·31	19	406·41	491·70
6. F. Trevaskis ..	,, ..	4	386·13	2	350·48	2	411·08	2	411·91	..	..	2	396·48	5	496·36	17	421·54	488·86
7. J. V. M. Wood	,, ..	13	339·45	1	293·26	8	419·10	1	429·61	2	364·26	3	465·70	5	492·52	33	396·26	488·52
8. F. Bidgood ..	,, ..	5	319·10	1	443·52	2	431·03	..	..	2	482·81	..	..	5	477·05	15	416·80	486·96
9. J. A. Huffer ..	,, ..	10	335·31	3	379·18	1	326·65	3	448·61	2	418·00	1	499·67	6	468·08	26	396·43	480·97
10. K. McGarvie ..	,, ..	8	321·68	6	373·62	9	409·59	9	377·05	1	408·56	..	..	1	346·12	34	372·04	473·16
11. A. A. Broad ..	,, ..	6	318·68	3	377·21	..	..	2	424·02	..	..	..	..	4	480·00	15	387·45	470·95
12. J. Hutchinson ..	,, ..	3	346·76	..	..	2	379·64	3	378·97	2	424·02	..	..	3	478·95	13	401·64	468·14
13. Vaughan Bros.	,, ..	6	338·07	5	359·51	..	..	1	450·35	1	384·19	1	422·30	1	419·98	15	366·85	463·69
14. W. H. Hurrey ..	,, ..	4	357·77	2	375·58	2	363·12	3	425·12	..	..	..	..	6	420·92	17	394·67	463·17
15. Dr. Mailer ..	,, ..	11	336·97	2	343·12	2	322·69	2	430·71	2	367·01	3	395·47	3	490·63	25	371·68	461·78
16. H. A. Cooper ..	,, ..	2	324·08	1	404·57	4	345·15	2	465·66	1	435·82	1	410·53	1	351·64	12	380·22	456·22
17. J. E. Chadderton	,, ..	5	311·69	..	..	3	394·83	1	455·17	2	462·02	..	..	3	392·02	14	378·45	455·45
18. R. J. M. Dobson	,, ..	4	336·84	..	..	1	393·13	2	408·88	1	407·44	..	..	3	415·55	11	382·94	453·90
19. T. Harvey ..	,, ..	..	..	2	307·22	1	296·70	1	316·88	1	338·38	1	543·68	6	476·10	12	413·89	453·22
20. J. J. Desmond ..	,, ..	2	303·45	1	362·74	1	479·04	2	383·05	1	444·21	..	..	3	429·10	10	394·63	452·63
21. W. Woodmason	,, ..	4	309·11	1	366·36	1	462·45	2	382·94	2	384·29	..	..	6	424·75	16	384·26	446·01
22. G. Esler ..	,, ..	8	330·57	2	320·08	..	..	1	431·51	1	427·57	4	389·92	2	409·71	18	362·38	445·82
23. W. K. Atkinson	Milking Shorthorn	8	296·70	..	..	..	..	6	374·47	2	309·80	6	428·19	17	427·66	39	386·65	445·12
24. C. Chitty ..	Jersey ..	5	318·36	1	380·40	2	387·54	1	304·41	1	442·36	..	..	3	411·34	13	363·70	444·04
25. T. E. Simpson and Son	,, ..	3	312·30	1	406·93	2	372·78	1	402·53	2	382·49	1	423·12	5	415·50	15	383·83	443·33
26. E. B. Neave ..	,, ..	3	341·49	..	..	1	293·21	4	346·79	2	368·31	1	570·74	..	..	11	364·75	441·15
27. A. Cox ..	,, ..	7	273·63	6	308·37	2	360·74	3	358·56	1	358·56	3	441·27	11	438·31	33	363·19	436·66
28. G. T. Young ..	,, ..	3	323·63	..	..	2	388·63	..	..	1	392·00	..	..	4	414·76	10	379·92	435·92
29. R. G. Gay ..	,, ..	4	298·95	2	320·76	1	325·23	..	..	1	416·55	..	..	5	438·21	13	366·93	434·97
30. J. Clyne ..	,, ..	9	316·18	..	..	2	347·02	3	311·03	7	384·24	4	354·26	13	411·52	38	366·59	432·43
31. E. J. Vagg ..	,, ..	4	323·97	1	357·21	..	..	..	..	..	..	..	..	5	408·71	10	369·66	427·66
32. A. W. Gorman ..	Ayrshire	2	256·01	2	338·23	1	317·09	1	408·38	1	399·51	..	..	3	440·74	10	363·59	425·59
33. W. H. Atherton	Jersey ..	2	252·18	2	342·93	1	264·43	1	363·78	..	..	..	..	8	432·21	14	376·86	425·29
34. E. P. Hayes ..	,, ..	3	276·97	..	..	2	409·06	3	412·00	1	366·43	..	..	5	389·09	14	364·06	423·92
35. Dookie Agricultural College	Ayrshire	2	331·46	1	328·49	1	298·60	2	362·03	1	312·55	1	418·30	4	407·75	12	364·66	420·66
36. Department of Agriculture	Friesian..	2	349·84	..	..	..	..	4	346·08	..	..	..	..	4	401·51	10	369·00	417·00
37. G. A. McNabb & Son	Jersey ..	11	259·58	7	307·51	3	391·14	..	..	2	332·11	1	345·44	10	402·35	34	329·84	416·25
38. N. B. Alston ..	,, ..	5	256·99	3	314·77	1	340·01	3	356·02	1	378·16	1	335·07	3	449·33	17	335·2	415·48
39. Mrs. A. J. Black	,, ..	8	284·98	1	340·98	1	274·07	..	..	..	..	..	..	3	418·41	13	319·24	413·43
40. P. J. Ducat & Sons	,, ..	4	282·54	3	288·00	1	286·13	..	..	..	..	..	..	6	416·09	14	341·20	409·63
41. C. Steele ..	,, ..	6	292·83	1	314·10	2	322·42	..	..	..	..	1	404·31	2	361·20	12	320·22	409·55
42. J. Plattfuss ..	Friesian..	3	249·96	1	410·52	2	306·74	2	334·27	3	306·51	2	320·63	14	411·61	27	361·70	408·53
43. R. K. Milne ..	Jersey ..	2	305·85	1	363·56	3	324·47	2	350·83	..	..	2	346·69	..	..	10	334·37	408·37
44. J. Charlton ..	,, ..	7	275·28	2	307·58	2	332·15	2	322·71	1	387·44	3	391·65	2	368·68	19	323·77	408·00
45. T. Knowles ..	Ayrshire	5	304·40	..	..	5	295·70	1	359·35	1	339·06	..	..	5	407·02	17	337·29	406·97
46. G. H. Bellfield ..	Jersey ..	1	311·26	1	298·81	..	..	1	321·20	2	364·86	2	366·14	3	423·60	10	366·40	406·40
47. A. J. Eldridge ..	Friesian..	2	331·05	..	..	2	321·59	..	..	..	..	2	306·89	4	421·54	10	360·70	404·70
48. W. H. Emmett	Jersey ..	3	327·55	2	340·14	..	..	1	323·59	2	334·28	..	..	3	345·29	11	335·54	404·68
49. Mrs. E. M. Lennie	,, ..	3	277·23	3	283·04	3	324·27	1	298·94	2	291·42	1	405·14	2	474·41	15	325·95	404·12
50. L. R. Archibald	,, ..	3	261·58	1	375·19	3	360·51	..	..	2	370·32	..	..	4	346·36	13	335·96	402·46
51. J. McDougal ..	,, ..	2	274·34	..	..	1	346·63	..	..	5	351·64	1	315·44	5	401·53	14	355·47	401·84
52. Ballarat Orphanage	,, ..	6	296·90	1	286·30	4	346·32	1	297·61	2	400·56	..	..	11	351·05	25	337·87	401·55

The Sheep Industry

Helpful Hints to Sheep-men

4.—Fat Lamb Raising.

By N. A. Bowman, Sheep and Wool Expert.

[Previous articles of this series, which appeared in the June, July, and August issues of the Journal, dealt with the selection of ewes and rams, lamb marking and classing the wool clip.]

THE raising of fat lambs in combination with wool production has grown in popularity because of the comparatively quick returns obtained when these two branches of the industry are worked together. If maximum returns are to be obtained, however, the combined operations must receive just as careful consideration and thought as are required in wool-growing alone. A ewe that will give good wool as well as a lamb costs no more to graze than one giving a lamb and inferior wool, and in the latter case the net return to the grower will be substantially lower.

The Purchase of Ewes.

Ewes for fat lamb production should be "framy" and have plenty of room, as constitution is denoted by size of carcass. Any ewe with a lengthy frame, also good width and depth, will have the required feeding and breeding room. Feeding room is necessary in order to provide an ample milk supply, which is of vital importance to the welfare of the lamb, and breeding room is essential to ensure a "growthy" well-set lamb. It has been proved that first-cross ewes mate splendidly with the Downs family of rams, while the closer-woolled sheep go better with the long-woolled family. The wool-producing properties of a flock of ewes to be utilized for lamb-raising also must be taken into consideration. As already stated, good wool is denoted by length of staple and character, the latter being indicated by crimp, density, and type.

It is desirable also that the breeding ewes should be even in type as a flock. Usually it is difficult to obtain such ewes in small lots, but, where a group of six or eight farmers each requires a small flock—100, or even less—they could combine and purchase one lot of 600 or 800, thus obtaining station-bred ewes on one mark of uniform size and quality.

In purchasing ewes it is important that consideration be given to age. It is admitted that the old ewe makes the better mother, but that is not the only matter to be taken into account. Experience shows that the greatest profit lies in making a purchase of young ewes, obtaining as many lambs as possible from them, shearing them as often as possible, and then, when favorable seasonal conditions allow, selling them off as fats. A fresh lot may then be purchased. Though old ewes make the best mothers, it must be remembered that they will not stand the privations following on a drought nearly so well as will young ones.

Lambs for Export.

The export trade demands a low set, full-quartered lamb, giving a nice, fine-grained quality meat, and also comparatively fine in the bone. Referring recently to the quality and type of Australian lambs, an English authority stated that—"New season's lambs have been a trifle disappointing except for a few of the specially selected lines. The lambs were not quite so uniformly level along the backs as the trade demands." This complaint emphasizes the necessity for a straight, level and broad back-line in the sire.

Further recommendations of London authorities are that the lambs should be brought forward to the recognized weight for

export in the shortest possible time, preferably in from twelve to sixteen weeks, so as to get the desirable *bloom* and sap. The ideal weight for the London market is from 32 lb. to 36 lb., but lambs up to 42 lb. weight are acceptable.

The correct blending of lean and fat brings the highest prices.

This type of carcass shows too high a proportion of fat to lean.

Selecting the Sire.

The next question is that of the selection of a sire. In addition to purity, type, &c., the question of breed also must be considered. Many times have I been asked the question, "What breed do you recommend for fat lambs?" I do not think that it can be claimed for any breed that it is the best for the production of lambs. Some breeds, of course, will thrive better than others in certain districts. Many people's preference for a particular breed is a matter of experience—either their own, or that of a fellow farmer.

For the earliest-maturing lamb, the British Downs family ranks foremost—the Southdown, Shropshire, Dorset Horn, Suffolk, or Ryeland. Strictly, the Dorset Horn and Ryeland cannot be classed as Downs; "Semi-Downs," perhaps, would be a better classification. The most important characteristic of the Downs, from an economic point of view, is the quality of carcass and mutton. None of these breeds readily becomes too fat, even though they attain great weights; further, their mutton is of superior quality, being firm, fine in the grain, and rich in colour.

Where feeding—that is, pasture—is absolutely satisfactory, the Down rams will sire what might almost be called the ideal type of fat lamb. However, the wool of this breed is inferior, the fleeces being light, comparatively short in length, hard and harsh in the handle, and, therefore, devoid of good manufacturing properties. Owing to this characteristic, the Down breeds are not profitable if the lambs have to be carried over, shorn, and sold as stores. Another reason why these breeds are not always desirable is that, in order to obtain good results from them, the best of feed must be available.

Perhaps the solution of the problem is the use of early-maturing rams possessing wool-growing characteristics. The chief of these long-woolled breeds, so far as Australia is concerned, are the English Leicester, Border Leicester, and Lincoln. They are characterized by the absence of horns, great size, and long wool usually possessing the silvery, glistening appearance known as "lustre." These breeds, as a rule, are quick growers, and are easily fattened, but the mutton is a little coarser in grain than that of the Down breeds. Throughout Victoria, particularly perhaps in some portions of the Mallee, the use of the Corriedale, an Australian breed of sheep, as a sire has brought about the production of a satisfactory type of lamb.

The desirableness of obtaining a pure-bred ram cannot be too strongly emphasized. Such an animal will sire infinitely better lambs than a mongrel, crossbred, or nondescript animal. In order that the buyer may safeguard himself, he should *obtain his rams from a registered flock-owner only.*

The ideal sire for the production of fat lambs possesses the following characteristics, which the purchaser should bear in mind when making a selection:—

1. A wide, deep, lengthy frame, compact and well balanced, the sheep to be set square on his four legs.

2. A head thoroughly masculine in character; the head is a valuable indicator of the "type."

3. A broad, deep, and well moulded chest.

4. The back line straight, level, and broad, covered with a thick firm-handling flesh. *Any sire with a thick firm-handling flesh is capable of siring a better class of lamb. (Where possible avoid rams with loose flabby flesh).*

5. Well sprung and deep ribs.

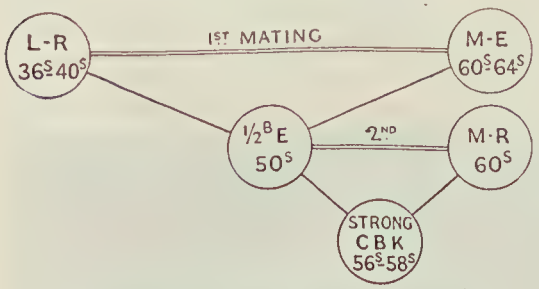
6. The hindquarters should be well carried out, long, deep, and square, not dropping much towards the tail.

7. The leg of mutton full and plump.

8. The legs straight and set wide apart.

9. The characteristic wool of the particular breed should be of good quality, and cover the whole body well and evenly.

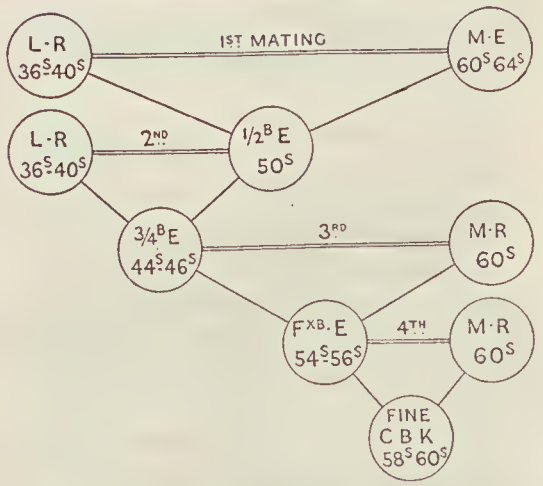
While, of course, one cannot pick flock rams having all these distinctive qualities, one can keep the ideal sire in mind, and try to select as near as possible to the standard set.



Short Way of Producing a CBK.

Mating.

Times of mating are controlled by the influence of climate and pasture, and it is a mistake to lamb in any district except at such times as conditions make desirable. A sufficient number of rams must be used; when fixing the number their ages should be considered. Another aspect of this question is that it is not desirable that the period of lambing be spread over too long a period of time; the larger and more even the line of lambs marketed, the greater will be the return. If at joining time any sluggishness in the rams is noticeable, the sheep should be yarded at night, and the rams raddled or marked by some means. *In no circumstances should rams be left with the ewes throughout the year;* if such were the practice there would be lambs of all ages and sizes in the flock.



Long Way of Producing a CBK.

All breeding ewes should be crutched some three weeks or so before they commence to lamb. Great care should be exercised when handling ewes in lamb so as to avoid any danger of mishaps. Much time and energy are wasted by roughly handling sheep—if one happens to miss the sheep it was intended to catch; it is not at all necessary to throw one's self at it as though engaged in a wrestling contest. It should be remembered that there are other sheep in the pen—catch one of them quietly and proceed in good style.

To crutch correctly the whole of the crutch around the tail head and inside of the hind legs should be shorn. When this operation is completed the sheep should be counted out when the counting-out pen is a little more than half full; this avoids undue crushing.

The next essential is careful management of the ewes during the lambing period, and under this heading must be considered the question of suitable paddocks and the provision of a good supply of lick. The lick recommended by this Department for sheep and cattle is as follows:—

Salt	60 lb.
Bone flour	30 lb.
Sulphur	5 lb.
Magnesium sulphate ..	3 lb.
Sulphate of iron	1 lb.
Potassium iodide ..	1 oz.
Manganese sulphate	1 oz.

In feeding tests carried out by the veterinary staff of the Union of South Africa, dicalcic phosphate was found to confer benefits equal to at least twice its weight of bone flour.

Dicalcic phosphate is now being manufactured in Melbourne, and may be substituted for bone flour in a lick as follows:—

Salt	75 lb.
Dicalcic phosphate ..	15 lb.
Sulphur	5 lb.
Magnesium sulphate ..	3 lb.
Sulphate of iron	1 lb.
Potassium iodide	1 oz.
Manganese sulphate ..	1 oz.

To mix, dissolve the required amount of potassium iodide and manganese sulphate in water, and sprinkle on the salt; add the other ingredients dry, and mix thoroughly on a tarpaulin or an impervious floor. Finally, pass the mixture through a sieve to ensure thorough mixing.

Where possible special paddocks should have been spelled in order to furnish fresh, clean pasture for the lambing. It is advisable to go among the ewes as much as possible before lambing in order to get them well accustomed to being rounded up and handled. They soon become quite used to the presence of the man who is looking after them, and will neither run away nor show any alarm at his approach. Only well-broken, silent, and well working dogs are permissible among lambing ewes. As the sheep is perhaps the most nervous of all domestic animals, it is a great advantage to have them quiet before lambing, so that in the event of any requiring special treatment they are less likely to suffer from nervous shock. It is of the utmost importance that the ewes during this period should be healthy, and have a good supply of lick available for them.

With timid ewes which may stray from their lambs, a practice sometimes adopted is to tie the ewe down and place the lamb at her head. A better practice is to provide in the paddock small enclosures as "mothering pens." Quite suitable enclosures may be made up with three small hurdles and some wire-netting.

Full attention must be given to each flock daily. Early morning and late evenings are the best times to be among the ewes and lambs. With maiden ewes one should make it a practice to be among them three, perhaps four, times a day.

In districts where foxes are troublesome it is a good plan to poison with strychnine any lambs that have already been killed—just sufficient strychnine to cover a sixpence is the usual dose. Sparrows, starlings, and parrots also make good bait. It should be remembered, however, that by poisoning dead lambs, &c., it is quite possible to catch innocent dogs and other animals.

At the same time as she is rearing her lamb the ewe is expected to grow a good fleece of wool. If the feed is scanty and short the lamb receives a setback, and the wool will suffer also. The correct feeding of the breeding ewe, therefore, is of vital importance.

"Conservation of the surplus fodder against the time of drought" is a subject that has been preached in season and out of season for years with but little apparent effect. There is, however, not the slightest doubt that cutting and storing, in the form of silage or meadow hay, the surplus grass and herbage in flush times will very materially minimize the losses by drought. Ensilage, properly made, is cheap, and with the addition of some grain and salt is almost, if not quite, equal to natural grass and herbage in maintaining sheep in health and vigour.

Let us consider briefly the question of rearing poddy lambs or pets. Quite a number of lambs can be saved by hand feeding. Many twins are born, and very often one of these gets left behind and becomes "unmothered." In such cases the lamb should be taken home and given to some one to rear. Young lambs can be reared in many different ways, some being good, while others are bad. When lambs are brought in first each should receive a very little cow's milk with warm water added, and also about half a small teaspoonful of castor oil. For the first few days they should be fed four or five times a day with milk and warm water, giving only from two to four good tablespoonfuls at a time. Later on feeding three or four times daily will be sufficient, of course, increasing the amount of milk as the lambs become bigger. Young lambs suffer from cold, and should be kept warm. Provide them with shelter where they may be warm and cosy, particularly during the cold hours of the night.

Marking and Tailing.

As a rule, few complications arise during lambing, and the shepherd should be sure his services are necessary before interfering with the ewe. When the time arrives for marking and tailing, temporary yards made with stakes, wire-netting, and a few hurdles should be

erected alongside a fence in the paddock where the lambs and ewes are for the purpose of marking.

The adoption of this system will lessen the risk of deaths from tetanus or blood poisoning, which frequently occur if the operation is carried out in filthy yards. If, on the other hand, the sheep yards are used, be sure they are clean. Disinfect with some sheep dip or other antiseptic, and also avoid rushing, so that the lambs will not become overheated.

All knives and pliers required should be thoroughly cleaned and disinfected before commencing and frequently while being used. A suitable disinfecting solution may be made up of one part carbolic acid and twenty parts of water. The catcher should rest the lamb on its hip bones on the top rail with its shoulders against either of his. He should then catch the hind legs over the hocks, draw them forward between the lamb's forelegs and its brisket and hold them there. The catcher generally calls the sex and presents the ear accordingly, but the marker should verify this before he, with his pliers, snips the ear mark in the left for males and in the right for females. Generally speaking, the tail is cut off at the second joint below the tail-head. The operator should throw the tails into two heaps—males on one side, ewes on the other, so that an accurate count can be made of the number of each sex when the mob has been dealt with. Before it is actually cut the skin should be retracted slightly towards the lamb's body by the man holding the lamb. When released it projects over the end of the bone, protecting it while healing takes place.

It is of the greatest importance to keep lambs growing from the time of birth, and such being the case, the sowing of fodder crops in any place where they are likely to be required is recommended; at any rate, a farmer should always be in a position to take his flock from the lambing paddock to better pastures. In order to lessen the chances of any setback, lambs should be marked while still young; if the operation be delayed, the check may be severe. It is not wise to wait until all the ewes have lambed; the lambs may be marked in batches as they become a few weeks old. This practice takes more time, of course, but pays in the long run.

A corner of one selling floor.

Tobacco Auction Sales

What the Results Show

By W. J. B. McDonald, B.Agr.Sc., Assistant Inspector of Agriculture, and G. E. Coghlan, Tobacco Expert.

THAT the method of selling tobacco leaf by auction is filling a long-felt want in the tobacco industry is evidenced by the increasing support that has been accorded each succeeding sale. It may surprise most people to learn that the total amount of leaf offered and sold at auction in Victoria this year is considerably greater than the State's average annual yield for the last ten years. This result has been achieved in the period of three months, despite organized opposition by many vitally concerned in the industry. Table I. shows the total amount of leaf offered at each of the three sales, and, in two instances, the percentage of the catalogue finally sold, together with average prices obtained.

Each sale has been attended by a large number of interested growers, and the educational value of these gatherings is shown by the general improvement in the "get up" of the lots offered in the second and third sales over that of the tobacco entered in the first of the sales. This decided improvement in such a short period is a tribute to the keenness of growers, particularly the newcomers. It is hoped that this improvement will be maintained until the wide variations that characterize baling and handling methods (as shown in accompanying illustrations) no longer exist.

Improvements in general baling methods are more pronounced than the improvement in grading, possibly because a good deal of the leaf offered in the latter sales was graded before auction selling commenced. No general increase in prices can be expected while the present standard of grading is maintained. At every sale, leaf properly graded brought

prices well in excess of the average being paid for that particular class of leaf. This fact was emphasized by the few well-graded lines that were offered. The apparent disparity in prices obtained for superficially similar lots, which caused a good deal of concern to many growers, mainly can be attributed to differences in grading.

TABLE I.

No. and Date of Auction Sale.	Quantity of Leaf Offered.	Quantity Sold at Auction.	Percentage Finally Sold.	Average Price per lb.
	lb.	lb.		
No. 2 (5.7.32)	172,160	64,959	96	19·262d. per lb. for 120,992 lb.
No. 3 (9.8.32)	192,193	111,807	98	21·692d. per lb. for 111,807 lb.
No. 4 (7.9.32)	421,908	164,489	Not yet available.	23·2d. per lb. for 201,655 lb.

N.B.—All figures relating to sales subsequent to auction are not in the possession of the writers.

Another most important factor is the degree of moisture present in the baled leaf. As the buyer, when assessing the value of the leaf, takes into account the estimated excess moisture present over and above the accepted standard, growers must realize that they do not succeed in "putting one over" the buyer by attempting to sell him water. In addition, the seller pays a good deal of excess freight, and leaves himself very liable to considerable loss from mildew following the fermentation that is normal to all tobacco at this period of the year.

All stored tobacco, whether on the farm or elsewhere, should be attended carefully. Fermentation cannot, and should not, be prevented, as it is necessary to the proper maturation of tobacco, but the degree to which it proceeds must be controlled. Tobacco stored in a dry condition will "sweat" without danger from moulds or mildew supervening. Tobacco on the farm, however, usually is stored in too moist condition, and the bulks must be turned frequently to prevent the excessive growth of moulds, which find the optimum conditions for rapid expansion in moist fermenting leaf. If fermentation is allowed to continue unchecked,

A general view of floor, showing various styles of packing.

the bulk may get sufficiently hot to cause a total loss of leaf.

During the last two auctions, not more than 2 per cent. of lots has come on to the floor in what the writers regard as correct condition.

The correct method of packing the hands in the bale. Note that there is no cross-packing.

To those present at each auction, it must be increasingly obvious that low-grade leaf and leaf previously rejected on the farm do not command any competition. Although a reference to Table I. shows that in the first two sales the selling agents have effected a clearance of much of this rubbishy leaf, growers must realize that the market for these lines is very limited, and probably a saturation point has been almost reached. In view of the above, growers are warned against forwarding large parcels of questionable leaf to any further auction.

Some growers still persist in forwarding green and wholly diseased leaf to the market. No one can be expected to buy it.

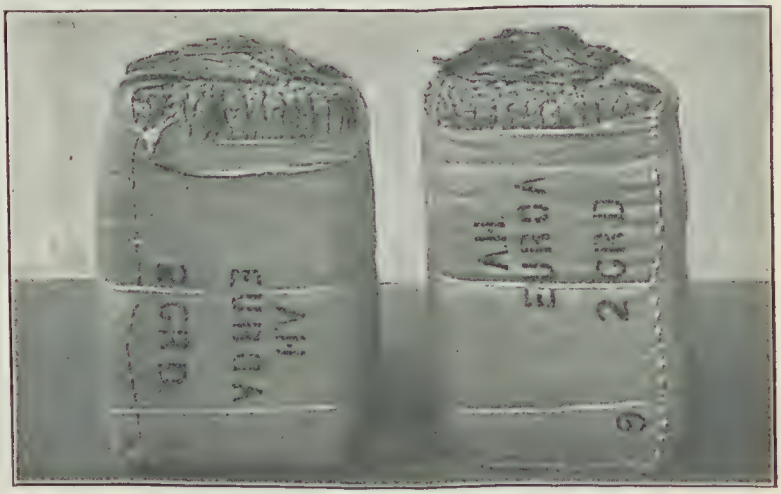
Other growers sacrifice a good sale at auction by placing enormous reserves on their leaf. It is not known whether this is due to ignorance of value, or to an exceeding optimism, but several growers eventually have accepted less than what was offered at the period of public auction. The very high reserves account for the large quantities of leaf passed in, the amount at the most recent sale totalling 60,853 lb.

Table II. shows the average prices obtained for leaf from various newer districts of the State. These cannot be taken as definitely establishing the comparative merits of those districts from a tobacco-growing point of view, but, in association with the following comments, they give some indication of their potentialities. Abbreviated press reports which catalogue highest prices obtained without indicating the size of the lot so sold are apt to be very misleading.

TABLE II.

District.	Leaf Sold during the Period of Auction.	Average Price Obtained.
	lb.	*d.*
Laanecoorie	2,033	32·7
East Gippsland	8,215	28·8
Gundowring	23,256	27·7
Horsham	10,059	24·8
Calivil	8,072	24·5
Cobram	5,691	22·3
Yarrawonga	5,699	18·7

In the figures presented, only those sales obtained during the actual periods of auction are considered. It is possible that when a more complete analysis of sales is made, some



Correctly "got up" bales, distinctly branded.

districts may appear in a slightly different light.

Laanecoorie leads the list with the excellent average of 32.7d. per lb., but in this instance only one grower was represented. This crop was grown beside the Loddon River, about 20 miles north of Maldon, on a light-red sandy flat, not at all typical of the bulk of the district. The area of similar country is considered to be very restricted, and any expansion in this district is likely to be limited. The bulk of this crop, which was grown with the aid of irrigation, would be classed as a bright mahogany.

The bale on the left shows neatly tied hands while those in the bale on the right are very roughly tied.

East Gippsland.—The total leaf submitted from East Gippsland was the combined produce of six new growers scattered between Briagolong on the west and Bairnsdale on the east. The soils on which the various crops were grown are mainly light sandy loams, which, at a depth of about 6 inches, merge into a reddish or brown sand, which in turn gives place at about 20 inches to whitish sand overlying a yellow clay or clay and sandstone conglomerate at about 30 inches. There are thousands of acres of similar country available in this district.

The leaf produced is fairly large, of good texture, and mainly a bright mahogany in colour. The highest price obtained by leaf from this district was 46d. per lb. All crops were grown under normal rainfall conditions.

Gundowring is situated in the Kiewa Valley. By far the greater percentage of land in this district is better adapted to dairying than tobacco-growing, being too heavy in character for the production of light, bright leaf. Most of the land on which tobacco was grown last year is a rich friable sandy loam, producing bright mahogany and mahogany tobaccoes. The very good prices obtained for over 23,000 lb. of leaf submitted are a reflection mainly of the efficiency and experience of a small group of growers. These crops were irrigated.

Horsham.—The growth of tobacco in the Horsham district is possible only under irrigation. Climatic conditions are widely different from those usually considered necessary to the growth of good quality tobacco. The soil is a whitish sandy loam liable to drift under windy conditions. Despite some high prices obtained at auction, the writers do not consider any great expansion of tobacco-growing wise or possible in the immediate neighbourhood of Horsham. Although under proper curing conditions a good colour is readily obtained, the life and elasticity characteristic of first class leaf are not apparent.

Calivil.—Here, again, tobacco-growing is made possible only by the supply of water from the Waranga Basin. The available area is strictly limited to the selection of those soils in the irrigation settlement which may be described as red sandy loams. Very little expansion is possible in this district.

Cobram and Yarrawonga.—At Cobram and Yarrawonga, tobacco-growing is or should be confined to the numerous sandy rises which are common to each side of the Murray River. These rises should be selected so that the essential irrigation water from the river can be pumped on to them when required. Here again the location of the site in respect to wind protection is an important factor. As a general rule, leaf from these sandy areas adjacent to the Murray River is light in colour, and rather negative in flavour. It should be quite suitable for blending with other tobaccos.

Tobacco Curing Barns

Plans and Specifications

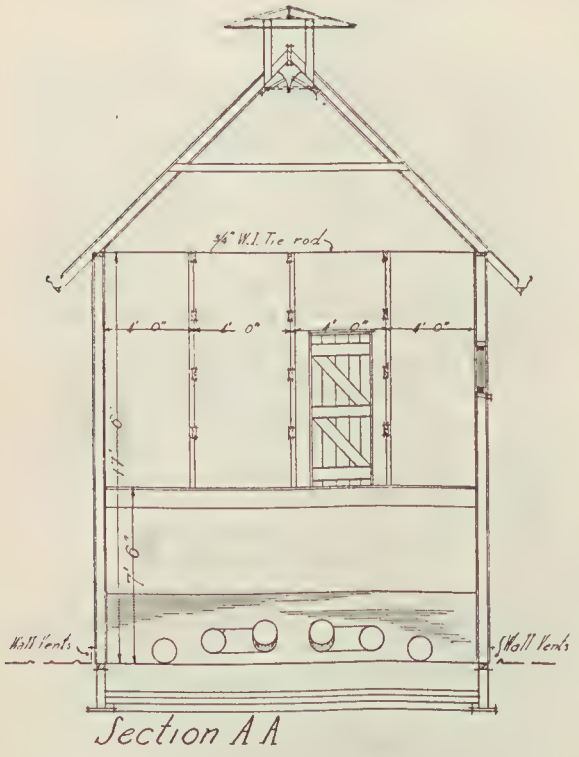
By W. J. B. McDonald, B.Agr.Sc., Assistant Inspector of Agriculture; and G. E. Coghlan, Tobacco Expert.

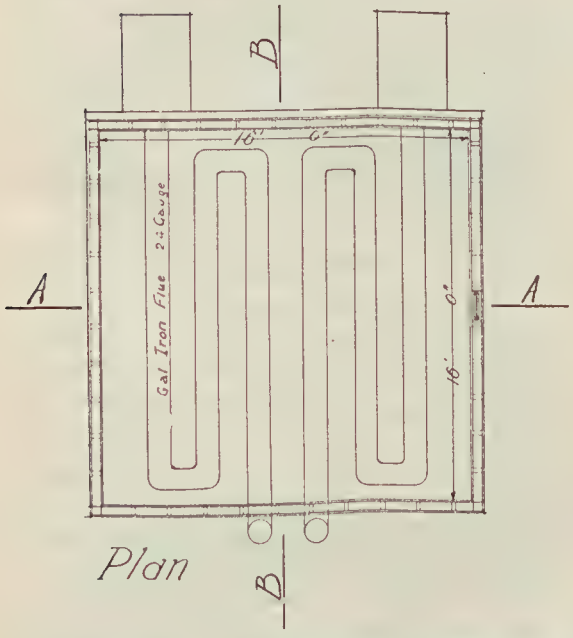
Tobacco Curing Barns at Eurobin.

[In response to numerous requests from all parts of the State the following article dealing with the construction of flue-curing barns has been reprinted from a previous issue of this Journal.]

The curing of tobacco involves chemical changes within the leaf cell, the manner in which these changes proceed depending on temperature and humidity conditions within the barn. The distinctive feature of the flue method of curing tobacco is that the curing barn is equipped with a system of large pipes through which gases artificially heated to varying temperatures are passed. The gases, of course, do not come in contact with the leaf.

To provide the necessary adjustment of temperature and humidity, a positively controlled ventilating system must be incorporated in the building, that is, the barn must be so constructed that the curer, at will, can make it completely air tight or, by altering the ventilators, provide any requisite movement of air. Several types of barn have been designed, individual builders incorporating various modifications with the object of securing better control of temperature and humidity. It is not possible to obtain any unanimity of opinion as to the best type of barn, each recognized style having its advocates. The





1.—Sectional elevation and plan of gable-roofed Barn, showing distribution of flues.

main difficulty encountered is in ensuring a uniform and sufficient movement of air, or at other times, in holding the barn in an air-tight condition.

The best type of roof is a much-debated point, popular opinion being fairly equally divided between the gable-ended style (fig. 1) and the "hip," or four-sided roof (fig. 10). At the present time the greater favour, possibly, is accorded the gable-ended roof.

To maintain a high temperature without too great a consumption of fuel, and to make further provision against air leaks the walls are double lined, the intervening space being filled with chaff, seaweed, earth, or some other insulating material.

Size of Barn.

When determining the size of barn to be built, several factors should be considered. Relatively small barns are more easily and economically handled than large ones, and in general turn out a better sample of leaf. The barn should be of such a size, that from the area of crop matured, and with the labour available, it can be completely filled in one day.

Practice has established a 16 ft. x 16 ft. barn with 17 ft. 6 in. walls as standard size for this State. This is quite a convenient size with which to work, and is capable of holding up to 8 acres of normal crop. The following sizes are suggested as being suited to cater for the areas indicated:—

12 ft. x 12 ft. x 14 ft., to handle 4 to 5 acres.
14 ft. x 14 ft. x 15 ft., to handle 5 to 6 acres.
16 ft. x 16 ft. x 17 ft. 6 in., to handle 7 to 8 acres.

Choosing the Site.

In handling tobacco leaf, it is advisable from the point of view of both economy and the quality of the cured leaf, to eliminate unnecessary transport. Consequently the barn should be situated in such a position that, as far as possible, it is close to both the tobacco field and the storage shed, but not close enough to the latter to involve it in any fire risk.

The site should be well drained and possessed of a soil that will afford a firm foundation. A gable-ended barn probably is placed most favorably when the direction of the ridge is at right angles to the direction of the prevailing wind.

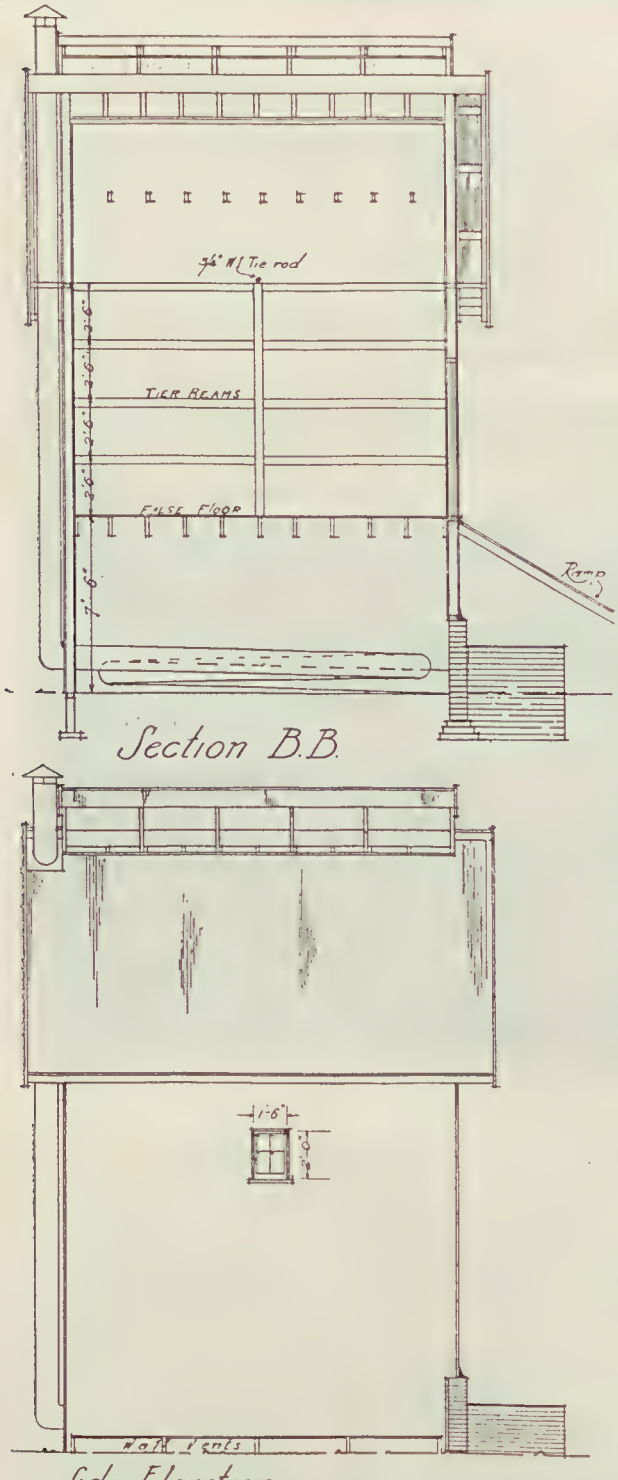


Fig. 2.—Side section and elevation of Barn shown in Fig. 1. In Section BB the height from ground level to the false floor should be 5 feet and not 7 ft. 6 in. as shown.

Materials.

Various materials may be used in constructing a flue-curing barn, the choice being a matter for the grower himself. Suitable materials are logs, weatherboards, galvanized iron, and asbestos cement sheets. Galvanized iron is the material most frequently used. Flat iron is cheaper, but not so rigid as the corrugated, and when the former is used it is necessary to construct a slightly more rigid framework than would be needed for the latter. With weatherboards there is greater risk of destruction by fire. Concrete is not regarded as suitable, because of its capacity to absorb an appreciable quantity of water which takes a considerable time to drive out when the drying process is being accomplished. This type of barn also takes much longer to cool down after the fires are drawn.

The accompanying plans illustrate fairly completely the method of constructing either a gable-ended or hip-roof barn, and are intended primarily for the guidance of those readers who have had no previous experience in barn construction. It is anticipated that greater refinements in ventilating and heating systems will be evolved by the ingenuity of Australian growers; in fact, several growers already have experimented along these lines. However, until such time as these refinements have been established as an economic proposition, new growers cannot do better than follow established practice. Readers desiring any amplification of the plans are invited to communicate with the Department of Agriculture.

The Furnace.

It is a generally accepted fact that two heating units are more effective in providing and maintaining a uniform temperature than one; consequently two furnaces are always recommended.

In many cases that section of the wall in which the furnaces are set is bricked to a height of 3 feet as a protection against fire. In all cases the fire box should be adequately insulated, 9 inches of brickwork backed by asbestos sheeting being the minimum protection allowable. The furnaces are built partly below and partly above ground level, provision being made for a fire box 1 ft. 6 in. wide by 2 ft. 9 in. deep by 5 ft. in length.

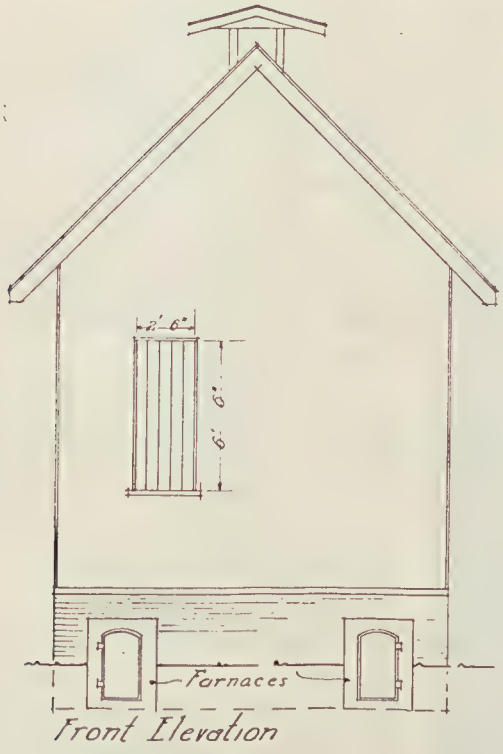


Fig. 3.—Front elevation of Barn shown in Figs. 1 and 2.

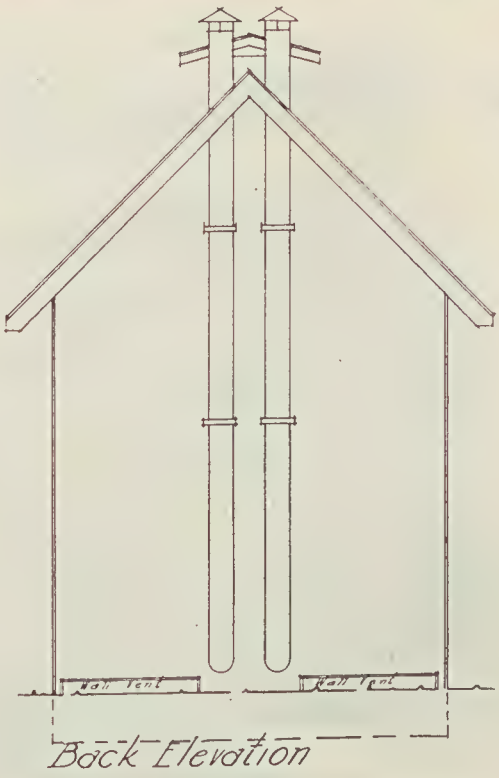


Fig. 5.—Back elevation of Barn shown in Figs. 1 and 2.

Take out the necessary trenches to a depth of 2 feet and build a 9-in. walled-brick furnace, the distance from the bottom of the pit to the underside of the arch being 3 ft. 3 in.

Cast-iron fire bars should be built 6 inches above the bottom of the pit to allow for the accumulation of ashes and provide the necessary draught. Cast-iron doors set on hinges let into the brickwork can be fitted advantageously. Mortar should be mixed, at least one week prior to using, from freshly-burned lump lime mixed with sand in the proportion of 3 to 1. Soil must be rammed firmly round the outside of the furnace, and iron stakes driven well into the earth at the four corners. These should be braced across the top with stout wire to prevent the furnace from cracking when heat is applied. A trench the full width of the furnace should be opened in front of it for a distance of 6 feet. The back of the furnace should sit flush with the wall of the barn, providing at this end for a circular opening sufficiently large to admit an 11-in. flue pipe at ground level.

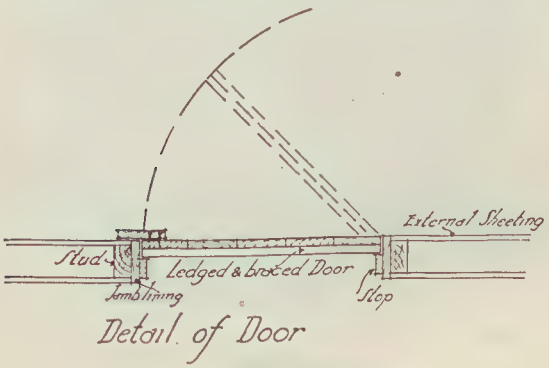


Fig. 4.—Detail of Door.

Flue Piping.

The flue piping is laid down in the manner indicated in Fig. 1, one system coming from each furnace and being placed about 2 feet distant from the walls. Commencing at ground level the flue pipe maintains a gradual rise to the point of exit. The first length of piping should be of heavy material; four-foot lengths of 10-in. cast-iron water piping

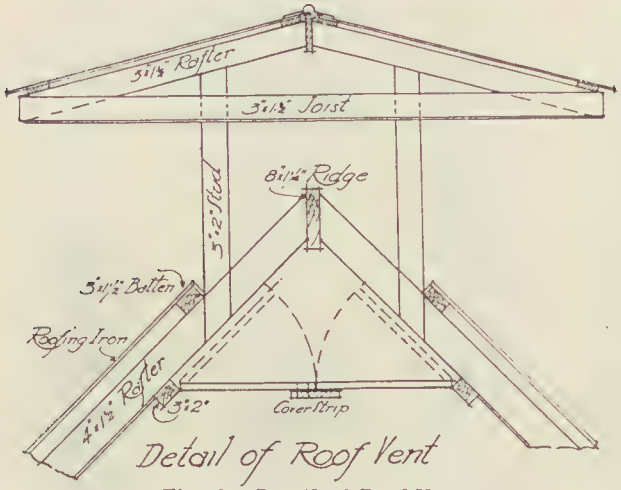


Fig. 6.—Detail of Roof Vent.

are quite suitable; the remaining flues may be constructed of 24-gauge or heavier galvanized iron; these may either be made by the local plumber or purchased made up from various manufacturers. The first length of flue preferably should be flanged, the flange lying flush against the inside wall of the furnace. It is set in with mortar; subsequent joints in the flue system should be as air-tight as possible. About 80 feet of 24-gauge flue piping and two 4-foot lengths of 10-in. cast-iron piping will be required.

The two pipes—one system from each furnace—are taken out of the barn together. At the point of exit, some suitable protection against fire must be provided. If at this point, over an area of 2 ft. 6 in. x 3 ft., the barn is single walled, the air space thus provided prevents risk of fire from contact between the material filling the walls and the hot flue pipe. The joints round the exit pipes should be packed with asbestos to guard against fire and air leaks. The two flues may unite in a single chimney or be carried on as two distinct chimneys, which should project 1 foot above the top of the barn. Dampers to provide for easy regulation of the furnace should be fitted. Where an iron chimney is used, it must be furnished with the necessary support. It can be lashed to the barn at several points with either hoop iron or wire.

In Fig. 10 a more costly but more satisfactory manner of taking out the flues is illustrated. It will be seen that the two pipes unite in a concrete box, the gases being carried upwards by a single chimney.

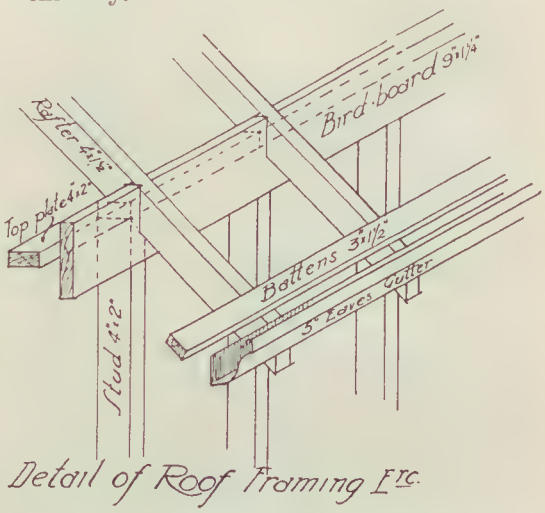


Fig. 8.—Detail of Roof Framing.

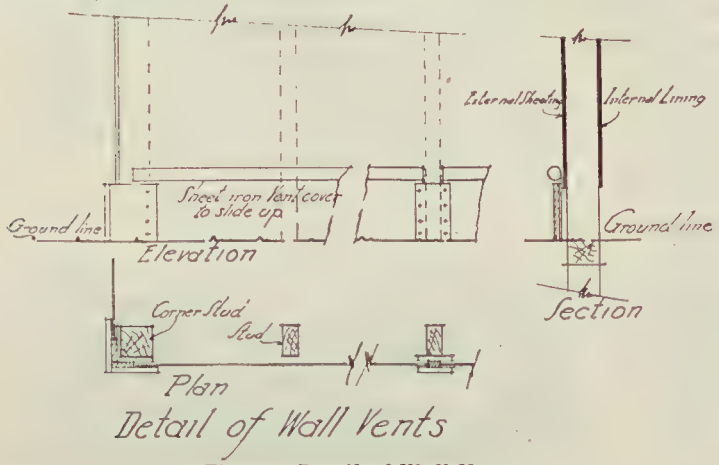


Fig. 7.—Detail of Wall Vents.

Ventilation is intimately associated with roof construction. The most essential factor to be borne in mind is that ventilation must be adequate and perfectly controllable. In a standard-sized barn probably more than 250 gallons of water per cure must be removed by the circulating air. It will be understood readily that a rapid removal of this quantity of water cannot be effected through small ventilators. It is considered that in a barn of this size the area of opening of both the top and bottom ventilators should be at least 16 square feet.

The bottom ventilators are placed just above ground level, and should form a more or less continuous opening round three sides of the barn. In the case of a gable-ended roof, the top ventilator should run the entire length of the ridge. With a "hip" roof it naturally would be built in the centre of the structure. The opening in this case should be at least 4 feet square. All vents must be fitted with effective shutters. The bottom vents provide approximately 48 linear feet of ventilating space, which should be 6 inches in depth. In the barn illustrated these vents are equipped with close-fitting sliding shutters (fig. 7). Hinged shutters are more easily fitted, but are not considered to be so air-tight.

The ventilating space at the top of the barn should extend the full length of the ridge, and be at least 1 foot in width. To effect this the roofing is not carried right up to the ridge beam. The opening thus left is protected from the weather by a false roof. This roof should be almost flat, as a steep pitch deflects the air downwards,

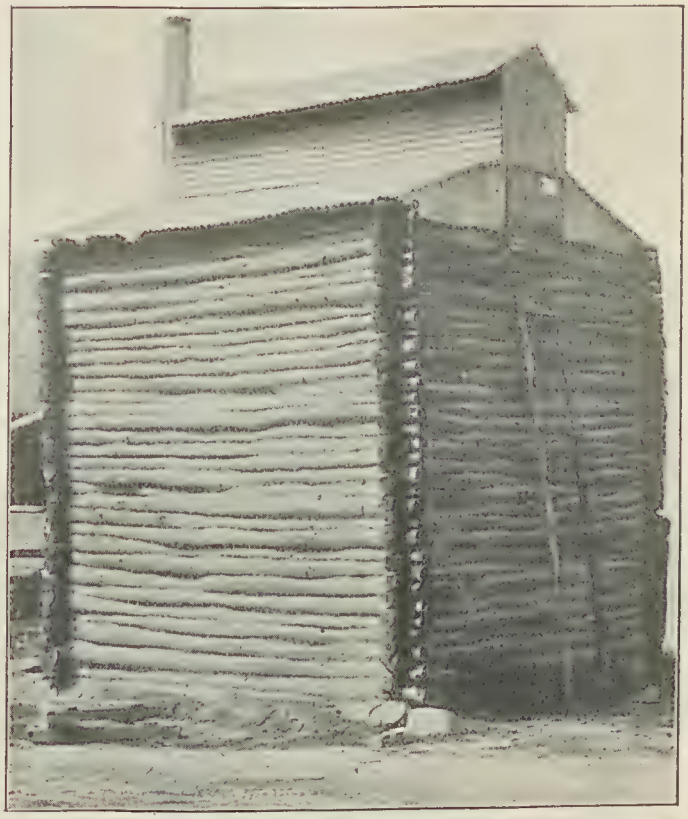


Fig. 9.—Typical Log Barn.

A Flue-curing Barn constructed of fibrous cement sheets.

setting up eddies and circulating currents within the barn. The vent is closed internally by hinged shutters carried on rafters running parallel to the ridge beam. These are controlled by cords running over pulleys. The shutters open upwards. Cross pieces must be fitted at suitable intervals for the purpose of carrying the shutters when they are allowed to fall into the closed position. The method of fitting and constructing is indicated in Fig. 6. To cover the crack between the two shutters, a cover strip should be nailed to one of them.

Details of construction of the eaves are shown in Fig. 8. Doors should be tight fitting. Fig. 4 suggests a suitable method of accomplishing this.

The revolving cowl illustrated in Figs. 10 and 11 is an example of an attempted refinement in ventilator construction. This method should eliminate any back pressure or aerial eddies caused by a strong wind blowing across the mouth of the ventilator. The inner and outer covering of the walls are left to the

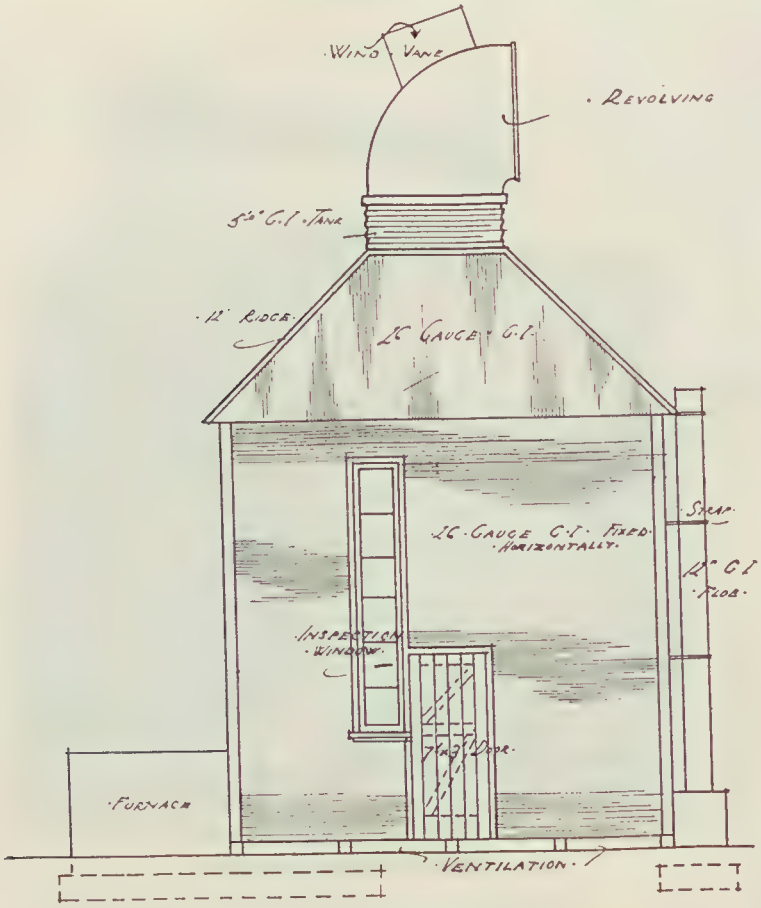


Fig. 10.—Plan and elevation of hip-roofed curing barn.

choice and convenience of the builder. It is considered that the cheapest iron available would do. The intervening space can be filled with any suitable material available. It is wise, however, to leave an air space around the furnace.

The roof should be covered with galvanized corrugated iron with 6-in. end lap and two corrugations side lap, and secured with spring-head nails. It may be lined internally with ruberoid or similar material, which should be carried down over the eaves to make a more air-tight joint. The roof over the ridge pole could be covered with flat iron.

A long narrow window as shown in Fig. 10 allows a more complete inspection of the hanging leaf than is possible through a small one.

The actual disposition of the tier beams (or racks on which the sticks of tobacco are hung) within the barn rests with the individual builder. The first tier, however, should be 7 ft. 6 in. from the floor with 4 feet between beams. Subsequent tiers should be 2 ft. 6 in. apart, or, in districts where the size of leaf is normally rather small, 2 feet apart, the top tier being level with the eaves.

In the gable-ended barn illustrated a floor is shown 2 ft. 6 in. below the first tier beams. The door, naturally, is on the same level, a ramp leading up from ground level. The floor is covered with slats placed just sufficiently close to enable one to walk on it with comfort. This floor,

not by any means a common accessory to existing barns, serves two purposes. It provides a somewhat more uniform movement of air, and greatly facilitates the placing of the sticks on the racks. In the illustration the floor is shown at 7 ft. 6 in. from the ground. This could be better placed at 5 feet, leaving the first tier beams at the 7-ft. 6-in. level. Where this upper floor is not fitted the door is at the ground level.

In this particular barn the tier beams are so arranged that they run in an unbroken series the full length of the barn, and are placed so that a person entering the door walks in between the beams.

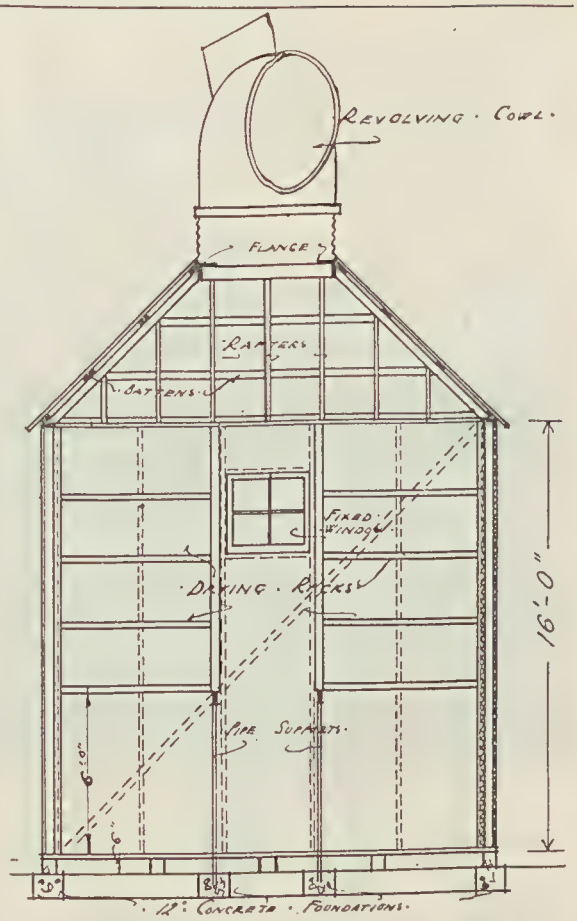
An alternate arrangement of racks is shown in Fig. 11. In this instance the racks run at right angles to the door opening, a corridor dividing them into two sets.

Specifications of Gable-ended Curing Barn.

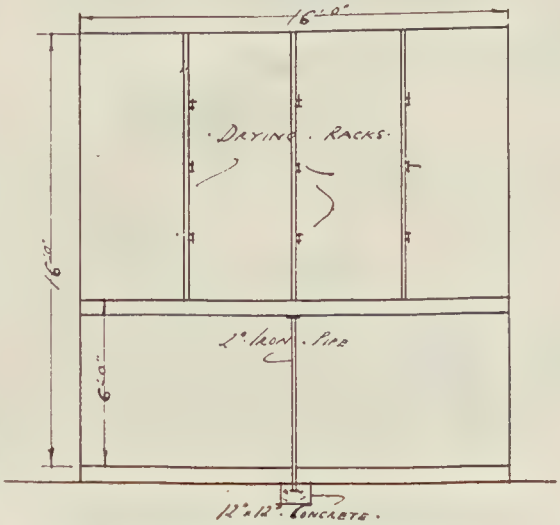
Stumps.—4″ x 4″ jarrah, at 4′ centres, with 9″ x 9″ x 1½″ sole plates.
Bottom Plate.—4″ x 3″.
Studs.—4″ x 2″ hardwood at 18″ centres, 4″ x 4″ at angles.
Top Plate.—4″ x 2″ hardwood, halved at angles.
Struts.—3″ x 1″ hardwood, checked into studs.
Roof Covering.—Galvanized corrugated iron, with 6″ end lap and 2 corrugations side lap, secured with spring head nails.
Roof Vent.—To be constructed with 3″ x 2″ studs, and 3″ x 1½″ rafters and joists.
Hinged vent covers to roof to be constructed of 6″ x ⅝″ T. and G. boards, hinged to 3″ x 2″ battens.
Door to be ledged and braced, constructed of 6″ x ⅝″ T. and G. boards, and hung with tee hinges.
Door Sill.—9″ x 1½″ jarrah.
Ramp to be constructed on 4″ x 3″ bearers, and covered with 3″ x 1″ hardwood battens.

A Log Barn.

In areas where standing timber is readily available, the most economical type of barn is what may be termed a log and mud or wattle and daub barn. A building of this type can be constructed, excluding labour charges, for an expenditure of about £40 to cover cost of roofing iron, fittings, and necessary squared timber. The logs required are as follow:—Eight solid logs not less than 9 inches in diameter at the smaller end, and about 18 feet long, to serve as the base of the structure; from 130 to 140 logs of similar length, as uniform in size as possible, and about 6 inches in diameter, to form the walls; four solid corner posts, 20 tier beams, and a quantity of smaller poles for rafters.



SECTION



ELEVATION OF DRYING RACK

Fig. 11.—Section of hip-roofed curing barn, showing position of drying racks.

Any logs showing signs of piping or hollowness should be discarded. Logs should be cut and barked as early as possible. At least two months should elapse between time of cutting and the erection of the barn. Sappy logs are very difficult to handle.

Corner posts, while not absolutely necessary, serve as a useful guide in maintaining the perpendicular nature of the walls, and later form a convenient frame on which to hang the tier beams. Corner posts 8 inches square at the smaller end should be erected at the four corners of a 16-feet square. These should be 4 feet in the ground, and project 17 ft. 6 in. above ground to the wall plate. The first cross beams should be let into the posts 7 ft. 6 in. above ground level, and as the weight they will have to carry is considerable they should not be less than 5 inches in diameter at the smaller end. On these, poles running the full length of the room are placed 4 feet apart. The arrangement of the tier beams is similar to that shown in Fig. 2.

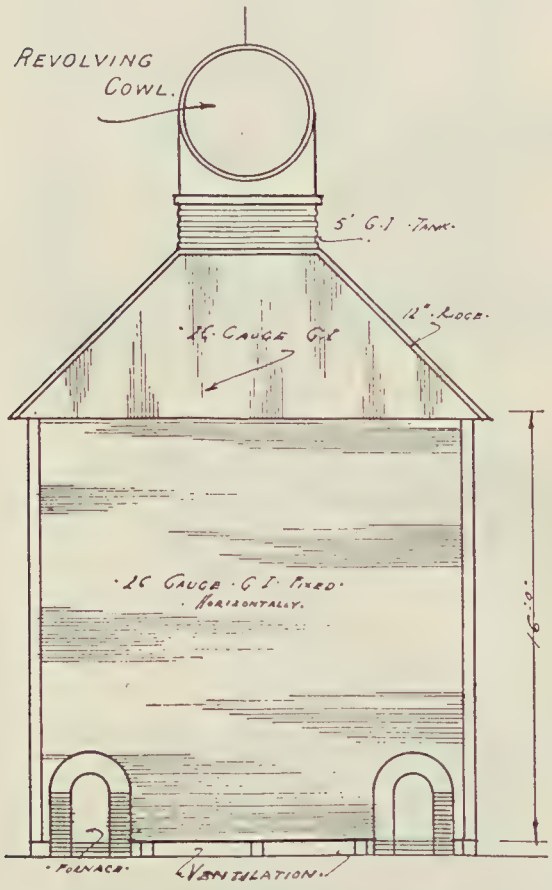


Fig. 12.—Side elevation of hip-roofed curing barn.

In constructing the wall, logs should be notched at each end and interlocked in the normal fashion. The interstices should be filled with mud, the material being well worked into the cracks so that leakage will be prevented. In one wall provision must be made for fitting in two furnaces, one door, and an inspection window. The size of the opening required for the furnace is 3 feet wide by 2 feet deep. A second window should be made at a different level so that as much as possible of the hanging tobacco can be inspected.

The method of construction of the furnaces and the arrangement of the flues have been already indicated.

The roof should have plenty of pitch and, except for the ridge beam, undressed timber may be used. Rafters should be placed 2 ft. apart, centre to centre. The arrangement of the top ventilators is similar to that detailed in Fig. 5.

The roof should be covered on the outside with roofing iron and lined inside with ruberoid sheeting or some similar material which being pliable can be carried down over the eaves to make a more air-tight finish. In a gable-ended structure that portion of the end wall between the eaves and the ridge beam can be covered with weatherboard or iron.

In laying the bed-logs and first covering log, arrangements must be made for provision of the bottom ventilators. This is obtained by cutting three 4-feet lengths out of the bed-log to a depth of 3 inches. The next log fitted should be of similar size to the bed-log, and cut in a corresponding fashion, so that when fitted the gaps cut out of the two logs fall opposite one another, making a series of vents 4 feet x 6 inches in depth.

Acknowledgment.

The writers gratefully acknowledge the assistance given by Mr. Carlton, of the Public Works Department, who prepared the plans and constructional details of the gable-ended barn. They are indebted also to Mr. Allan F. Showers, of the Glenbervie Timber Company, Essendon, for the plans of a "hip roof" barn.

Irrigated Pastures

Suitable Ingredients

By L. C. Bartels, B.Agr.Sc., Senior Irrigation Officer

THERE has been a steady increase in the area sown to mixed pastures in the irrigation districts of Victoria, and this development must be associated with the extension of top-dressing and a better appreciation of the influence of careful watering. Mixed grasses and clovers were sown at the Werribee Research Farm soon after that institution was established, some twenty years ago. As time went on and the stock-carrying capacity of the pastures under irrigation was so well demonstrated, the area seeded to grasses and clovers was extended, and now much of the earliest-sown lucerne has been replaced by mixed pastures.

Irrigated Pasture Plots, Werribee Research Farm.

Based on the experience at Werribee, the Department of Agriculture has advocated the sowing of pastures under irrigation as a supplement to lucerne, and now in every district from Sale to Swan Hill it has been amply demonstrated that, with careful management, good results are obtained from such pastures. It has been shown that they are long lived, that they provide variety in the feed of stock, and that they are highly productive. Tests at Werribee where clippings at monthly intervals from definite areas of mixed pasture have been weighed show that a production of 30 tons of green stuff per acre may be obtained in one year. Further, they give continuity of feed, since a suitable mixture of grasses and clovers provides for some growth throughout the year, although that growth is restricted in winter.

Emphasis must be laid on the need for careful preparation of the land, because the seed should be sown in clean ground and on a firm seed-bed. These conditions are best obtained by leaving the land in bare fallow for a few months. The careful grading of the land for irrigation also is very important.

Grasses and clovers will grow under varied conditions, and they will flourish in places unsuitable for lucerne (unlike lucerne, they will grow in low-lying places where water will remain for a time after irrigation or prolonged rain), and in autumn when the need for winter feed has to be thought of, pastures may be irrigated without much risk of harm if heavy rain should follow. However, the fact that grasses and clovers will tolerate wet conditions is no warrant for the use of excess irrigation, and care must be taken in the application of water. A proper distribution can be effected only by having the land carefully graded, while checkbanking will facilitate the control of the water. The border system is recommended for general use. This means the division of the land by low banks into long narrow bays which run down the slope; the water is admitted from a channel at the head of the bays, which are flooded in succession.

Two feet of water per annum gave best results in careful tests at Werribee. A 4-inch watering should be given at each irrigation.

Weighing the herbage from the irrigated pasture plots, Werribee.

To effect this on heavy land, it will be found necessary to supplement the first irrigation, but on light soils much more than 4 inches may be absorbed. This would lead to waste of water and other adverse effects, and in porous soils the size of the bays should be modified to limit the time occupied in watering and the resultant absorption. Regular watering is essential to keep grasses and clovers in a flourising condition, and irrigation at three-weekly intervals generally is necessary. In some districts in the summer time water is applied at intervals of ten days.

In our irrigation districts, top-dressing is all important to maintain grass lands in good condition, and on irrigated pastures an application of 2 cwt. of super. annually is recommended. Autumn is the best time to apply the manure, which may be drilled in or put on with a spreader or even applied by hand. Scarifying the ground is not a necessary preliminary to top-dressing. It is, however, a wise practice to break and spread cow droppings.

The best results from pastures will be obtained by grazing heavily, with periods of rest for the paddocks. The short pastures are palatable and more nutritious than coarse grass, and if a pasture is allowed to grow freely stock will neglect the rank growth, and concentrate on patches which they keep eaten short. By subdivision of the pasture areas, the grazing may be better controlled, and a division of the flocks and herds enables a farmer to regulate the movements of his stock so that his best cows or sheep get the best feed, and the seconds follow on, while others may be used as scavengers to effect the close grazing necessary for most satisfactory results. Sometimes the mower must be used as well to reduce the rubbish present. Heavy stocking implies a big demand for winter feed, but this may be provided for by the reservation of some of the paddocks in spring and the making of hay or silage from the excess growth. On many irrigation farms this system has been worked out to perfection. Paddocks may average only from 2 to 5 acres in area, and the records of production indicate the efficiency of these methods. Lucerne is commonly used for providing hay reserves.

The following mixture of grasses and clovers has been found satisfactory:—

	Per Acre.
Perennial rye-grass (Victorian or New Zealand old pasture seed)	10 lb.
Italian rye-grass	3 lb.
Cocksfoot	5 lb.
Perennial red clover	2 lb.
White clover	1 lb.
Alsike clover	1 lb.
Subterranean clover	1 lb.
Lucerne	1 lb.
Strawberry clover	¼ lb.

Perennial rye-grass provides the basis for the mixture, and in some of our best irrigated pasture it bulks largely in the cooler seasons. It is sold variously as English grass, Irish Ben, New Zealand rye, Poverty Bay, Hawke's Bay, and Western District rye-grass. These are names adopted for regional strains of rye-grass. Acclimatized strains of rye-grass, if they are productive, are the most suitable, and dis-

appointment often is experienced by those who sow European seed. Persistent strains have developed in parts of Victoria and New Zealand by natural selection over many years, and seed from these is available under guarantee.

Rye-grass tends to thin out in newly-sown irrigated pastures, but in several districts it is spreading naturally from the places where it was sown.

Italian rye-grass is included in the mixture, because it makes rapid growth, and produces considerable feed while the other species are developing. It is an annual or biennial grass, and carries on by re-seeding. There is evidence in some districts that Italian rye-grass also is spreading naturally on irrigated land. Only a small seeding is suggested, because in the first season this grass will grow tall and dense to the detriment of the other grasses and clovers which are tiny when young.

Wimmera rye-grass may be included in a mixture sown under irrigation, but it makes such rapid growth that only a light seeding need be made. In those districts where the holdings are large and the water allotment is insufficient for intensive development, Wimmera rye-grass should not be omitted from the mixture. Mixed with subterranean clover, it has shown itself to be well suited for conditions in those districts where the practice has been to rely on watering natural pastures in autumn to promote a growth of winter feed.

Cocksfoot is a long-lived grass with a good reputation, and is popular in the irrigation districts. If not grazed down the plants get tussocky, and the herbage will become coarse, but under a system of close grazing it does not present these features, and is readily eaten by stock.

Prairie grass is a good winter grass, which makes rapid growth, and of which stock are very fond. It is not perennial, but seeds freely, and will show up in pastures if they are not grazed heavily. It may be sown in addition to the grasses listed.

Several other grasses are under observation in departmental tests, e.g., Timothy, Meadow Foxtail, Kentucky Blue, and the Fescues.

Timothy, when sown separately amongst plots of other grasses, seems to be the first choice of stock, which keep it eaten closely. However, it does not appear to thrive in mixtures under the conditions in our irrigation districts, although a few plants may be found in our oldest pastures.

Meadow Foxtail persists and extends in wet places. It is an early grower in spring. Kentucky Blue grass, which is establishing itself in many places, is long-lived and aggressive, but pastures at Werribee with this element spread throughout them have proved to have high carrying capacity. Kentucky Blue makes early growth in spring, but the stalks get very wiry when mature.

Toowoomba Canary grass (*Phalaris tuberosa*) makes good winter growth, and resists dryness, but stock seem to neglect it when other grasses are available.

White clover is proving itself to be one of the best of pasture plants in the irrigation districts, and a most encouraging feature is that it is spreading naturally in most districts where due attention is given to watering and manuring. It is perennial, and seeds freely, but spreads also by creeping stems which root at the joints. This gives it an aggressive character, and enables it to grow freely even amongst paspalum, to which it makes a splendid complement. The white clover which is spreading might truly be called Victorian wild white clover, but it is different to English wild white clover which was featured by seedsmen and others a few years ago. This Victorian wild white clover is a much bigger type with rather coarse stolons or runners, while English wild white is characterized by small leaflets and a mat of small runners. Seed is not available from Victorian centres, and the best for our conditions is the New Zealand wild white.

Perennial red clover makes a valuable contribution to mixed pastures during the first four years. It makes upright growth, and produces abundant feed while the pasture is young and the permanent elements are developing. Although it sets seed and new plants appear in different places, it does not persist long in pastures. It makes excellent hay, but if too much is sown in a mixture it increases the risk of bloat to grazing cows.

Alsike clover is a very useful pasture plant, particularly suitable for wet conditions, and showing also resistance to dryness. It lasts for five or six years, and is generally very conspicuous in a pasture during the second year. It is an upright grower, and exhibits some of the characters of both red and white clover, to such an extent that originally it was assumed to be a cross between these two.

Subterranean clover has grown in favour in irrigation districts, and most settlers are familiar with its appearance and characteristics. It is an annual, and dies down about November of each year, but because of its

peculiar habit of burying its seed, continues from year to year and thickens. When this clover has established itself the buried seeds germinate in autumn, or even in summer for that matter. The young plants make rapid growth under irrigation in autumn, and it is this feature which commends it. In late spring the long trailing stems will extend in all directions, and a mat of foliage develops during October, when there seems to be a danger of its monopolizing the ground. But if conditions are made right for white clover, this will dominate the subterranean clover—the luxuriance of the latter when it occurs being only an indication of the fact that summer irrigation has not been regular or adequate for white clover. In circumstances where regular irrigation cannot be practised, there is no better clover than subterranean for winter feed. When the plants grow abundantly in spring and die off, the dry feed is readily eaten by stock.

Strawberry clover has creeping stems, pink blooms, and globular seed heads. It is regarded with mixed feelings by farmers. Those who know it well are agreed that stock are fond of it, but many complain that it does not grow freely. It is not prominent except that it spreads and monopolizes patches of ground, particularly in the depressions, but stock are exceedingly fond of it, and on any land that is being constantly grazed it gets no chance to develop. Strawberry clover luxuriates in moist situations, but coupled with this liking for wet places, it has ability to resist dryness. It has developed naturally in many districts and is spreading. In mid-summer it can be seen in patches with its dark-green foliage, pointed leaflets, and rosy-coloured flowers growing in depressions on roadsides and in places where water sometimes lies. The seed of strawberry clover is expensive, and sometimes it is difficult to get a good germination. It is advisable to rub the seed over sand paper or some such surface to wear the seed coat a little. This is a tedious process, but 1 lb. of seed will go a long way. A sure way of introducing strawberry clover is to dig spits of earth containing portions of the creeping stems and transfer them where required, or simply to "heel-in" pieces of the stem in low-lying pastures during early spring. The strawberry clover flats at Tarwin are famous. In the northern districts, notably at Swan Hill and Cohuna, there may be seen growing a very vigorous strain of strawberry clover with large leaves and coarse runners.

Lucerne is a good plant for inclusion in a pasture mixture, but it does not withstand heavy grazing—1 lb. of seed per acre will provide a good sprinkling of lucerne plants which will contribute to the bulk of the pastures during the summer months. In the early years of the pasture it will be conspicuous but under grazing it will gradually disappear. Lucerne is an important element in pasture mixtures for places where water supplies may be limited. Its deep-rooting habit makes it resistant to dryness, and it will look fresh and vigorous when white clover is wilting. In passing, it may be said that besides lucerne sub-clover, Wimmera rye-grass, Toowoomba Canary grass (*Phalaris tuberosa*), and tall oat grass show resistance to dryness.

Increasing Lucerne Yields

Advantages of Top-dressing

By E. T. Beruldsen, B.Sc. (Agri.), Irrigation Field Officer

WHEREVER lucerne is grown, and particularly in the irrigation districts of Victoria, there has been a rapid development of better cultural methods, not the least of which is evident in the conscientious attention given to top-dressing. Indeed, it appears hardly necessary nowadays to preach the value of manure. The great majority of farmers are fully convinced of the need for regular manuring, but as some may "weary in well-doing," one is perhaps justified in reiterating a few of the fundamental principles underlying the practice of top-dressing. There have been cases in which, because of the financial stress, and low prices for primary produce, farmers have deliberately withheld manure from their lucerne and pastures as a means of retrenchment. Undoubtedly this is false economy. The position has been admirably expressed by a farmer at Tongala, who, when asked recently whether he intended tc top-dress this year, replied, "I could not afford *not* to put it on."

When a crop of lucerne hay is harvested, a proportion of each of the elements essential for plant growth is removed from the soil in the lucerne itself. Alternatively, when lucerne is grazed, the mineral material removed from the soil goes to build up the frames of the animals, or to produce milk, &c. Nitrogen, the most important element in this respect, seems to be adequately replaced, in most cases, by nitrifying bacteria in the soil, or in the case of leguminous crops, of which lucerne is one, by the nitrifying bacteria which live in conjunction with them, and form nitrate rich nodules on the roots.

The vast majority of Victorian soils are notably deficient in phosphorus, and depletion of this very important element must be made up by regular top-dressing. An average yearly crop of 4 tons of lucerne hay per acre will remove approximately 50 lb. of phosphoric acid, and a dressing of 2 cwt. of superphosphate contains only that amount of available phosphoric acid. It should be obvious then that when, as is very often the case, yields much heavier than 4 tons of hay are obtained, even more than 2 cwt. of superphosphate per acre can be applied with profit. Superphosphate is the best type of phosphatic manure to apply, as in it, the phosphoric acid is water soluble, and is immediately available to the plant.

These fundamental principles have been strikingly demonstrated by numerous departmental tests at Werribee, and in various test plots situated in other irrigation districts of the State. At Swan Hill the application of 6 cwt. of superphosphate per acre trebled the yield of lucerne as compared with the unmanured control. In one year a yield exceeding 9 tons of hay was obtained, while the average yield on this plot, over a period of five years, was 8¼ tons of hay per acre.

At Tongala, up to 4 cwt. of superphosphate per acre was applied, and with this dressing the yield was twice that of the unmanured plots. Yields in this case reached the very satisfactory maximum of 6½ tons of hay per acre on a 15 per cent. moisture basis. At Cohuna also, although yields were generally lower, the benefit derived from annual dressings of superphosphate up to 4 cwt. per acre was very marked. Of course, if the full benefit is to be derived from top-dressing, adequate moisture conditions, attained by regular and judicious waterings, are essential.

The benefits accruing from top-dressing are not confined to increased yields. The quality of the fodder is enhanced, through an increase in the mineral content, and consequently the health of stock is directly benefited, eliminating the necessity for supplying "licks" of variable composition. Weed growth and inferior fodder plants such as annual grasses are kept in check, and very often entirely suppressed by the vigorously growing lucerne. Growers who have visited the departmental test plots at Werribee or elsewhere must have been struck with the comparison between the clean stand of vigorously-growing lucerne on the plots heavily top-dressed with superphosphate, and the stunted plants on the unmanured plots, fighting a losing battle with weeds, inferior grasses, and even with white

clover, which when present becomes aggressive in the absence of adequate competition from lucerne.

The practice of scarifying lucerne has fallen largely into disuse. The only apparent advantage from scarifying was the absence of annual grasses in the first spring growth of lucerne. In no case where the practice has been investigated has it resulted in increasing the yield of lucerne—on the contrary, the evidence points to an actual decrease in yield, probably due to injury caused to a considerable proportion of the lucerne plants. The time and money formerly put into cultivation can be far more profitably directed into applying *more* superphosphate.

Generally, when lucerne is grazed and top-dressing is not practised, the life of the stand is comparatively short. The use of superphosphate increases the longevity of the stand, whether it be grazed or cut for hay. The lucerne on which the Swan Hill plots were situated was five years old at the commencement of the test, and subsequently was rejuvenated when superphosphate had been applied. The tests were carried on for five years, and when the lucerne was ten years old it was still producing high yields of hay on the plots top-dressed with superphosphate. Although, since the tests were concluded three years ago, the whole of the paddock has been uniformly top-dressed with superphosphate each year, one can still distinguish quite easily the plots which were *originally* top-dressed with superphosphate.

The wonderfully improved winter growth obtained when lucerne has been regularly top-dressed is not the least of the added advantages. This extra green bite, coming at a lean period of the year so far as plant growth is concerned, is greatly appreciated by farmers.

Recently preliminary studies have been made of root-development of lucerne top-dressed with superphosphate and lucerne not so treated. These studies have shown much superior development in the case of the top-dressed lucerne.

Farmers in the Goulburn Valley are well acquainted with the very tenacious nature of the band of red clay subsoil immediately underlying the 6 inches or so of surface soil. In the December, 1931, issue of this *Journal*, Mr. W. Jewell, Agricultural Research Chemist, described the soil type in the Goulburn Valley, accompanying the description with typical soil profile diagrams and tables of chemical and mechanical analyses. The Tongala soil profile showed a surface soil of 6 inches with, beneath it, a band of red clay 16 inches in depth. This second layer was shown to have a very high clay content up to 38 per cent. Mr. Jewell pointed out that obviously this type of soil could not reach maximum productivity until by some means water and roots were enabled to pass freely through the clay pan.

In the lucerne test plots on the property of Mr. J. Bullingham at Tongala a trench was dug recently across the "4 cwt. super." plot and the adjoining "no manure" plot. Soil samples were taken at various depths, and these showed that an even higher clay content than the average was present. On the plot which had received an annual dressing of 4 cwt. of superphosphate since 1925, when the stand was young, the lucerne roots were well developed, and had penetrated the red clay band with only slight evidence of branching. In many instances these roots were traced to a depth of 5 feet, the limit of the exploration. On the other hand, the lucerne roots on the "no manure" plot were stunted, were very branched, and in no instance had penetrated beyond the band of red clay.

The importance of this can be recognized when we remember how this type of soil must benefit from the wonderful subsoiling action of the well-developed lucerne roots. Further, the effect reacts to the benefit of the lucerne plant itself in that the effective range of the plant for obtaining an adequate supply of moisture and plant foods is so greatly enhanced.

When used in conjunction with superphosphate, soil amendments such as lime and gypsum, applied in considerable amounts, have exercised a beneficial effect on this and other heavy types of soil. However, from an economic stand-point, the results from such an application have not been nearly so good as when extra superphosphate has been applied instead. Where gypsum deposits are easily accessible, as in the case of the Swan Hill flats, and where the gysum can be transported to the block, and applied very cheaply, an economic return is assured.

Generally superphosphate is best applied to lucerne in early spring, but it can be applied at any time during the year to suit the convenience of the farmer, and marked benefit will follow its application. There does not seem to be any advantage from a yield point of view in splitting up a dressing, so that is given at two or more times during the year.

Summer Pruning of the Vine

Shoot and Bunch Control

By F. de Castella, Viticulturist

THE dormant vine *must* be pruned in winter, but there are certain operations we can sometimes usefully apply in its active or growing state, and which are included under the general term of "summer pruning."

Winter or dry pruning is by far the more important; without it the vine soon gets hopelessly out of shape, and out of control. That work, however, has long since been attended to. The vines are now sprouting, and the time will soon come round when one or more of the different forms of summer or herbaceous pruning may need attention.

In the first place, it must be recognized that summer pruning is infinitely less necessary than the dry or winter form. Of the different operations that constitute the former, none are absolutely necessary, though some may be of real use in certain special cases. Most of them are severe on growth, and need to be applied with judgment and discrimination.

All pruning weakens the vine, and the summer forms do so to a much greater extent than does dry pruning. A wrong idea prevails in many suburban gardens, that suppression of part of the green growth prevents the vine from wasting its strength. This is rank heresy. The leaves are the lungs and stomach of the plant; their removal must necessarily weaken. Though such removal is often harmful, there are cases when it may be quite useful on over-strong growers, for example, that tend to produce wood at the expense of fruit. Here, deliberate weakening, by summer pruning, may actually improve the yield.

The weakening effect of the different operations varies greatly—with some it is only slight; with others, it may be very considerable—more so, indeed, than the grower recognizes.

Let us briefly consider these different forms:—

Disbudding, for which the vines will be ready very shortly, signifies the removal of such sprouting buds as bear no fruit, and will not be needed at next dry pruning. Its weakening effect is trifling, and it is nearly always useful. With some vine sorts, that have a tendency to sprout many water shoots, it is indeed necessary. It is particularly useful in the case of young vines that are being gradually formed or shaped. Disbudding should be early. The removal of a sprouting bud is scarcely felt by the vine, but the loss of a young cane with functioning leaves is much more severe.

Stopping, or pinching, means the suppression of the growing tip of a young shoot in October. It checks the growth in that shoot, diverting the sap into buds which otherwise might not sprout, and which may be needed for the next dry pruning. In this way it becomes a complement to long pruning, providing replacing wood near the base of the annual rod. Though seldom necessary, it is often distinctly useful, especially for the shaping of young vines during the second and third year.

A drastic form of stopping is sometimes applied with advantage to the Waltham Cross and some other grapes. If practised early, when about a dozen leaves are showing, strong laterals are forced out, bearing second crop, which will be early enough to ripen properly. This artificially induced second crop is sometimes finer fruit, and it may strike a later and a better market than the main crop that it supersedes.

Topping is very similar to stopping—it may, indeed, be classed as a later and more drastic form. It is carried out after blossom, and sometimes a good deal later. Instead of the terminal bud, the tip, consisting of several internodes, is removed. Topping is often practised by careful growers, who like to see their vines neat and well trimmed, though they do not realize the cost.

Of all operations performed on the vine in summer, this is the one most liable to abuse. It is seldom useful, and very often distinctly harmful. The warmer the climate, the more

severe it is on the vine. In some cases it improves the fruit the season it is applied, but it nearly always weakens the vine in the seasons that follow. If practised repeatedly, and in too drastic a manner, it is a fruitful cause of decline and premature old age. Vines that are not irrigated should seldom, if ever, be topped. Irrigated vines suffer less, but it should always be applied with caution, and only on very strong growing vines—over-manured and over-watered vines may indeed benefit, but treatment such as renders it advisable is not sound practice. It is on a par with whipping up the horse, and then putting on the brake.

Cincturing.—Cincturing or girdling is an occasional operation with most vines, but it has become a matter of necessity for the Zante currant; without it, most of its fruit is shed shortly after blossom, hence its poor yield when first grown here many years ago. Cincturing has always been a regular practice in Greece, the home of the Zante. It was tried here, and the hitherto poor bearer became a heavy cropper.

The operation is a form of ringbarking, but the ring is exceedingly narrow—about $\frac{1}{8}$ inch wide. The Zante currant is cinctured on the main trunk with a special tool, or even a good strong knife, when it is in full blossom, or immediately after. The two cuts penetrate to the cambium, and the intervening ring of bark is removed.

Other vines do not tolerate this as well as the Zante. If cinctured, as they sometimes are, it should be done on a rod, or even on the current season's growing cane, but not on the main trunk. The operation is of little avail against that form of faulty setting known as "hen and chickens," large and small seedless berries in the same bunch. Applied much later in the season—about new year—it is said to increase berry size, and to advance maturity. As practised on the Zante, the effect is rather the reverse.

Tying up or twisting in, needs attention in summer. Formerly vines were tied up with rushes, binder twine, raffia, and even wire. These are now discarded, it having been found that by judiciously twisting them round the wires, the vine canes can be made to hold together just as effectually as if tied.

Bunch Control.—Bunch limitation and trimming are not practised to the extent they merit. These are, perhaps, the most effectual means we have of improving the quality of table grapes that bear freely, such as Gordo Blanco, Muscatel, and, to a lesser extent, Waltham Cross. Scraggy, badly filled bunches with small berries that do not ripen properly are often the consequence of there being altogether too many bunches on the vine at blossom. They cannot possibly be all brought to perfection. Nature comes to the rescue, and causes many berries to drop. But she does it, unfortunately, in a haphazard way; quality does not concern her at all. The result is the formation of numerous scraggy bunches, with lengths of stalk, bare of berries, and quite unmarketable.

It is a mistake to think that yield depends on the number of bunches. Beyond a certain point, an increase in the number of these does not mean any increase in the weight of grapes vintaged. To put it another way: Of two vines of equal capacity, one may have twice as many bunches as the other, and yet not a pound more weight of grapes; but there will be no comparison in quality. The vine with fewer bunches will have fruit worth several times as much as the others.

Growers of choice Gordos usually limit the number of bunches by hard pruning. The same end can be attained by bunch thinning. It is indeed better for the vine, since very hard pruning imposes a strain on vitality. Gordos often sprout in spring, showing 60 bunches and over. This is far too many; one-third to one-half of these can be suppressed with advantage, and the remainder shortened, the tail and unnecessarily large shoulders being pinched off. This bunch limitation must, of course, be carried out before blossom—the earlier the better. Removal of potential bunches goes against the grain, but the grower should remember that he is not reducing the weight of his future crop.

Bunch trimming, and the thinning of berries, if too crowded, is carried out later, from the time when they are buck-shot size until before they change colour. It is of great value to improve berry size, and facilitate packing. It is done with blunt-pointed scissors, and, though tedious, it is well worth while, especially for shipping grapes.

Foliage Removal.—In a wet autumn, partial stripping of basal leaves, to allow air and sunlight to quickly dry the grapes, reduces mould development. Removals must be judiciously carried out, else the accumulation of sugar will be seriously interfered with.

In conclusion, a word on a different subject: that of disease control. The danger period is approaching, and outbreaks of fungus troubles

[*Continued on page 454.*

Manurial Trials with Potatoes

Results for 1931-32 Season

By J. T. Ramsay, Potato Expert.

THE variations in the effects of different manures on the potato crop during the past season were quite as marked as in previous tests. Yields in the different districts varied considerably, ranging from light to heavy. The season was most erratic. It opened with a favorable spring and early summer; a good start was made by crops generally, and the prospects were excellent. During December and January practically drought conditions obtained, and at the end of the latter month an almost complete failure of the crop might have been expected. During the first week in February copious rains came and altered the whole aspect again. This rain, however, did not fall evenly over the whole of the potato-growing districts, some getting too much and others too little. The result was a wide variation in the yields.

It was expected, owing to the advanced state of the crops when the drought broke, that considerable damage would result from second growth, but, except in a few cases, this was not so, and in many districts crops responded to the moisture in an astonishing manner. To instance a case illustrating this, it may be mentioned that on the property of Mr. J. J. Clark at Koonongwootong, near Coleraine, what is believed to be both a State and Australian record yield of 25½ tons to the acre of marketable tubers was obtained. Further west —at Portland—crops suffered from too much rain, and yielded only a light crop of sound tubers. In Gippsland Central and South-east only moderate crops were dug. Certain parts of the central highlands had insufficient rain, and yields were light. The returns from Koowee-rup and Moe Swamp lands were reduced by excessive moisture, while the south-western districts of Koroit, Illowa, and Beech Forest were favoured with good yields, and results at both Romsey and Newlyn were good. On the whole, it may be said that the State's crop was above average, and there was for the most part a noticeable reduction of losses from the more common diseases.

Manurial trials were carried out at eleven potato-growing districts in the State, Beech Forest being included for the first time. The results obtained are given herewith.

ILLOWA.

The earliest plot harvested was at Illowa, near Warrnambool, where planting was done in early August of last year, the district being an early one, and not liable to spring frosts. The plots are located on the farm of Messrs. Sheen Bros., where the soil is a rich volcanic loam of high value, and for many years past has yielded heavy crops without the aid of any artificial fertilizer. So fertile did it prove in the past that many growers believed fertilizers were not necessary to enable it to continue to yield in abundance. Trials have been conducted there for four years now, and have proved that, notwithstanding the high natural fertility of the country, it responds very appreciably to manurial treatment. The past season's results provide substantial corroboration of those previously obtained. This can be seen from an analysis of the yields from the various manurial treatments. In these trials the soil, cultivation, and seed are the same on each area, the only varying factor being the kind and quantity of manure. Variations in yields therefore may be accepted as being due solely to the different manurings.

Crop of Up-to-Dates grown by Mr. T. Taylor, of Cashmore, with 6 cwt. super. and 1 cwt. ammon. sulph. per acre.

TABLE I.—POTATO MANURIAL TRIALS, ILLOWA, 1931-32.

Manure per Acre.	Weight. Marketable Tubers.	Increase due to Manure.	Percentage Increase.	Cost per Ton Increase.
	T. C. Q.	T. C. Q.	%	£ s. d.
Super., 2 cwt...	6 13 0	0 16 0	13	0 12 0
Super., 3 cwt...	7 12 0	1 15 0	30	0 8 1
Super., 4 cwt...	8 1 0	2 4 0	37	0 8 0
No manure ..	5 17 0	..	..	..
Super., 3 cwt., amm. sulp., 1 cwt. ..	9 7 0	3 10 0	60	0 7 6
Super., 3 cwt., amm. sulp., 1 cwt., pot. sulp., 1 cwt.	8 7 0	2 10 0	42	0 18 0
Market garden, 3 cwt. ..	7 16 0	1 19 0	33	0 13 1
Basic phos., 3 cwt. ..	7 15 0	1 18 0	32	0 9 6

At Illowa seven different manurial treatments were tried (and there was one plot to which no manure was given) over an acre of land, and the several plots were duplicated on a second acre. The object of the duplication was to lessen the possibility of error which might occur because of abrupt variation in the quality of the soil.

In computing results at harvest two separate weighings are taken from each plot on each of the 2 acres, and the average weight of these four weighings off measured areas is taken as the yield for the particular treatment. This method is followed at all centres.

The Illowa plots showed a marked difference in favour of manuring, the greatest being 9 tons 7 cwt. from 3 cwt. super. + 1 cwt. ammonium sulphate per acre as compared with 5 tons 17 cwt. from the unmanured plot. The increase per acre was 3 tons 10 cwt., or 60 per cent., due to the application of the "3 and 1" mixture. It is interesting to note that the cost of this increase was only 7s. 6d. per ton. It should be stated here that in calculating the cost of each ton increase from manures, the Melbourne price of the manure is taken. Potato-growers at different distances from Melbourne can easily calculate what the extra cost to them would be. The influence of ammonium sulphate at Illowa can be ascertained by comparing the yield from the "3 and 1" with that from 3 cwt. super. by itself. In this season the ammonium sulphate increased the return by 30 per cent. —a very material improvement. The application of super. at a greater rate than 3 cwt. does not give an increase proportionate to the rate of application. The other mainly phosphatic manures—market garden and basic phosphate—while comparing favorably with super. involve a higher cost per ton increase. All things considered, the "3 and 1" dressing so far has proved to be the best and most profitable at Illowa.

Potash last season gave a decrease of 18 per cent. of crop as compared with the yield from the "3 and 1" mixture.

This will be seen from Table II. giving the average results for the four years during which experimental work has been carried on in this district.

TABLE II.—AVERAGE RESULTS, ILLOWA, FOR FOUR YEARS, 1928-29 TO 1931-32.

Manure per Acre.	Average Tonage.	Average Percentage Increase.
	T. C. Q.	%
1. Super., 2 cwt.	7 18 0	26
2. Super., 3 cwt.	8 9 0	35
3. Super., 4 cwt.	8 12 0	37
4. No manure	6 5 0	..
5. Super., 3 cwt., sulp. amm., 1 cwt.	9 7 0	50
6. Super., 3 cwt., sulp amm., 1 cwt., sulp. pot., 1 cwt.	9 16 0 (3 years only)	36
7. Market garden, 3 cwt. ..	7 18 0	26
8. Basic phos., 3 cwt. ..	7 5 0	16

KOROIT.

The manurial variations tested on the farm of Mr. W. J. Anderson at Koroit during the 1931-32 season were similar to those used at

Illowa in the same district. The soil here is also volcanic, but of a stronger type than at Illowa. The sowing was a late one, and though definite increases were obtained from the manures, the results were not so marked. The heaviest increase again occurred in the case of the "3 and 1" manuring, which gave 2 tons 16 cwt., or 30 per cent. over the "no manure" at a cost of 9s. 5d. per ton.

It is notable that here again there is a distinct depression caused by the application of sulphate of potash, the increase in the case of this plot being one-third down from that obtained from the use of 3 cwt. super. and 1 cwt. ammonium sulphate. The much higher cost in producing each extra ton also should be noted—25s. as compared with 9s. 5d. where the "3 and 1" was used. Tables III. and IV. show the results at Koroit. The variety used was Snowflake.

TABLE III.—POTATO MANURIAL TRIALS, KOROIT, 1931-32.

Manure per Acre.	Weight. Marketable Tubers.	Increase due to Manure.	Percentage Increase.	Cost per Ton Increase.
	T. C. Q.	T. C. Q.	%	£ s. d.
Super., 3 cwt...	11 1 0	1 16 0	19	0 5 3
Super., 3 cwt...	10 6 0	1 1 0	11	0 13 7
Super., 4 cwt...	10 8 0	1 3 0	12	0 16 6
No manure ..	9 5 0	..	..	..
Super., 3 cwt., amm. sulp., 1 cwt. ..	12 1 0	2 16 0	30	0 9 5
Super., 3 cwt., amm. sulp., 1 cwt., pot. sulp., 1 cwt.	11 1 0	1 16 0	19	1 5 0
Market garden, 3 cwt. ..	10 9 0	1 4 0	13	1 1 3
Basic phos., 3 cwt. ..	9 18 0	0 13 0	7	1 7 8

TABLE IV.—AVERAGE RESULTS, KOROIT, FOR THREE YEARS, 1928-29 TO 1931-32.

Manure per Acre.	Average Tonage.	Average Percentage Increase.
	T. C. Q.	%
1. Super., 2 cwt.	6 7 0	32
2. Super., 3 cwt.	6 2 0	27
3. Super., 4 cwt.	6 5 0	30
4. No manure	4 16 0	..
5. Super., 3 cwt., sulp. amm., 1 cwt.	6 16 0	41
6. Super., 3 cwt., sulp. amm., 1 cwt., sulp. pot., 1 cwt.	8 5 0 (2 years only)	33
7. Market garden, 3 cwt. ..	6 2 0	27
8. Basic phos., 3 cwt. ..	5 17 0	22

MILLBROOK.

Several trials were carried out at Millbrook, on the Ballarat line. The plots are on the property of Mr. P. J. Ryan, whose soil is a new volcanic loam which has been in cultivation for very many years. The tests were for various manurial treatments, cultivation, time of cutting seed, methods of storage, and the effects of dipping.

TABLE V.—POTATO MANURIAL TRIALS, MILLBROOK, 1931-32.

Manure per Acre.	Weight. Marketable Tubers.	Increase due to Manure.	Percentage Increase.	Cost per Ton Increase.
	T. C. Q.	T. C. Q.	%	£ s. d.
Super., 2 cwt...	5 11 0	3 9 0	164	0 2 9
Super., 3 cwt...	5 15 0	3 13 0	173	0 3 11
Super., 4 cwt...	6 8 0	4 6 0	204	0 4 5
No manure ..	2 2 0	..	..	..
Super., 3 cwt., amm. sulp., 1 cwt. ..	7 0 0	4 18 0	233	0 5 4
Super., 3 cwt., amm. sulp., 1 cwt., pot. sulp., 1 cwt.	5 11 0	3 9 0	164	0 13 0
Market garden, 3 cwt. ..	5 8 0	3 6 0	157	0 7 9
Basic phos., 3 cwt. ..	4 14 0	2 12 0	123	0 7 0

Millbrook was one part of the State that did not get a sufficiency of rain at the critical period last season, and consequently the yields were light. In conformity with the recent alteration made in the programme for potato manurial trials, the light dressings of super. at the rate of 2, 3, and 4 cwt. per acre were used singly and the 3 cwt. in conjunction with

A 15½-ton Crop grown by Mr. T. Taylor, of Cashmore, with 6 cwt. super. and 1 cwt. ammon. sulph. per acre.

Experimental Plots, Beech Forest.

ammonium sulphate and sulphate of potash. This reduction in the rates of super. from 3, 6, and 9 cwt. was made after it had been definitely determined that the heavier rates were in excess of what most of the volcanic soils of this State can profitably utilize.

TABLE VI.—AVERAGE RESULTS, MILLBROOK, FOR FIVE YEARS, 1927-28 TO 1931-32.

Manure per Acre.	Average Tonage.	Average Percentage Increase.
	T. C. Q.	%
1. Super., 2 cwt.	3 9 0	60
2. Super., 3 cwt.	3 19 0	83
3. Super., 4 cwt.	3 19 0	83
4. No manure	2 3 0	..
5. Super., 3 cwt., sulp. amm., 1 cwt.	4 15 0	121
6. Super., 3 cwt., sulp. amm., 1 cwt., sulp. pot., 1 cwt.	4 1 0	89
7. Market garden, 3 cwt. ..	3 12 0	67
8. Basic phos., 3 cwt. ..	3 4 0	48

TABLE VII.—CULTIVATION TEST, MILLBROOK.

	T. C. Q.	Increase. T. C. Q.	Increase. %
One cultivation ..	4 14 0	..	..
Two cultivations ..	5 18 0	.. 1 4 0	.. 25
Three cultivations ..	6 15 0	.. 2 1 0	.. 43

TABLE VIII.—TIME OF CUTTING TEST, MILLBROOK.

	T. C. Q.	Increase. T. C. Q.
Fresh cut	6 2 0	.. 5 1 0
Cut one week ..	2 16 0	.. 1 15 0
Cut two weeks ..	1 15 0	.. 0 14 0
Cut three weeks ..	1 1 0	..

Owing to the poor season in this district the "no manure" plot yielded only 2 tons 2 cwt. per acre. Such a return, however, makes the increases from the manures all the more striking. The biggest increase was gained by the "3 and 1" mixture, which gave an additional return of 4 tons 18 cwt., or 233 per cent. over the unmanured lot at a cost of only 5s. 4d. per ton of increase. During the past season the application of 4 cwt. super. per acre showed to advantage with an increase of 4 tons 6 cwt., equalling 204 per cent. at the low cost of 4s. 5d. per ton. The effect of ammonium sulphate here is most marked, showing a gain of 60 per cent. over the yield from the same quantity of super. alone, viz., 3 cwt.

The potash failure is again apparent, this manure causing a drop in yield of 1 ton 9 cwt., or 69 per cent. as compared with the "3 and 1." This potash handicap is very constant (Warragul excepted) and still inexplicable. Market garden manure and basic phosphate do not show to the same advantage as the same quantity (3 cwt. per acre) of superphosphate by itself, although they gave appreciable improvements in yield by comparison. These results are highly satisfactory, inasmuch as they substantiate those of previous years.

TABLE IX.—BAGGED *v.* BOXED SEED, MILLBROOK.

	T. C. Q.
Bagged seed	2 0 0
Boxed seed	6 12 0
Increase from boxing	4 12 0

TABLE IXA.—DIPPING TEST, MILLBROOK.

	T. C. Q.
Undipped	4 0 0
Dipped	6 12 0
Increase from dipping	2 12 0

TABLE IXB.—REPLICATED MANURIAL TRIALS.

Manurial Treatment.	Yield per Plot.	Yield per Acre.
	lb.	cwt.
B. Super., 3 cwt. +ammon. sulph., 1 cwt. per acre	44·3	117·0
A. Super., 3 cwt. per acre..	40·4	105·8
D. Super., 3 cwt.+ammon. sulph., 1 cwt.+pot. sulph., 1 cwt. per acre	37·4	98·0
C. No manure	15·4	40·3
Mean Yield	30·6	80·2
Standard Error ..	·84 (2·75%)	2·25

N.B.—For significance, all differences must exceed 6·23 cwt. per acre (or 2·38 lb. per plot).

It will be noted that all differences between treatments are significant. The low figure for Standard Error at 2.75 per cent. is very satisfactory indeed.

Cultivation Test.

To further demonstrate the benefit to be derived from proper inter-cultivation of the crop when growing, cultivation tests with the horse-hoe were continued last season. These were attended with striking results as will be seen from the table below, which shows in both tonnage and percentages the increases due to cultivation.

Good mechanical condition of the soil has a very large influence on the shape as well as the weight of the tubers. In hard or compact land the tubers, when increasing in size, meet with restrictions which cause deformity of the natural shape of the variety grown. In well-cultivated soil, however, they are free to develop without restriction and the produce is of a much more desirable type. Moisture is also conserved over dry periods, and weeds are kept in subjection, thus permitting the plants to benefit to the full from the food and moisture in the soils.

For the past five years the average increase in favour of two cultivations has been 28 per cent. and 51 per cent. where three cultivations were given.

Time of Cutting Test.

The season at Millbrook was exceptionally favorable for the illustration of the influence on the crop of the time which elapses between the cutting of seed potatoes and the planting. Very striking and progressive decreases were recorded with the distance of time between these operations, the most aged producing what was practically a failure of crop. The results in this test probably were accentuated more than usual because of the peculiar seasonal conditions, but it is a definitely proved fact that seed which is planted as soon as possible after cutting has the greatest chance of success.

For the last three years the average increase due to fresh cut seed over that cut three weeks has been 366 per cent.

Bagged and Boxed Seed.

Once again the considerable benefit from correct storage of seed potatoes has been thrown into relief by the result of the last season's Millbrook trial which was designed to test this. The seed used was the same as to variety, time of harvest, and crop from which it was harvested. The only difference was that one lot was boxed and the other stored in bags.

Storage in boxes gave the necessary ventilation requisite for the carrying over of the seed without impairment. Storage in bags prevented this, and caused an early and excessive bud growth, together with a degree of delicacy in the strength of the buds which made them liable to be broken and bruised, and this meant a reduction of vitality, with the result shown in Table IX.

During the past five years the average increase due to boxed seed has been 2 tons 15 cwt. per acre or 125 per cent.

FISH CREEK.

Fish Creek is situated in south-east Gippsland, and has been a potato-producing centre for many years. The soil for the most part is a grey clay loam of good body and capable of holding moisture well through a dry period. It is one of the districts which requires heavier applications of superphosphate than do the volcanic areas, and responds well to manures. The results of the past season are in favour of the mixture of 6 cwt. super. + 1 cwt. ammonium sulphate per acre. This dressing gave an increase of 3 tons 1 cwt. of marketable tubers per acre, or 46 per cent. more than 6 tons 10 cwt. harvested where no manure was applied.

TABLE X.—POTATO MANURE TRIALS, FISH CREEK, 1931-32.

Variety used—Carman.

Manure per Acre.	Weight. Marketable Tubers.	Increase due to Manure.	Percentage Increase.	Cost per Ton Increase.
	T. C. Q.	T. C. Q.	%	£ s. d.
Super., 3 cwt...	8 4 0	1 14 0	26	0 8 1
Super., 6 cwt...	8 10 0	2 0 0	30	0 14 3
Super., 9 cwt...	8 10 0	2 0 0	30	1 1 5
Super., 6 cwt., pot. sulp., 1 cwt. ..	8 4 0	1 14 0	26	1 7 9
No manure ..	6 10 0	..	..	..
Super., 6 cwt., amm. sulp., 1 cwt. ..	9 11 0	3 1 0	46	0 13 3
Super., 6 cwt., amm. sulp., 1 cwt., pot. sulp., 1 cwt.	8 7 0	1 17 0	28	1 12 1
Market garden, 6 cwt. ..	7 14 0	1 4 0	18	2 2 6
Basic phos., 6 cwt. ..	7 11 0	1 1 0	16	1 14 3

This result from the "6 and 1" is 1 ton 4 cwt., or 18 per cent. higher than where

potash was used in conjunction with super. and ammonia. This is a further instance of the inefficiency of potash and ammonia. It will be noted that where super. was increased from 6 cwt. to 9 cwt. per acre, no corresponding increase in the yield took place. It is rather remarkable that such a comparatively low rating of super. should be, under Victorian conditions, the maximum profitable dressing, while other countries with no heavier rainfall find the highest profit from quantities greatly in excess of this amount. In England and New Zealand the recognized dressing is 15 cwt. per acre and over. This, however, is all to the benefit of the Victorian (and Tasmanian) grower. At Fish Creek market garden manure and basic phosphate do not bring so good a response in weight as does superphosphate.

TABLE XI.—POTATO MANURIAL TRIALS, FISH CREEK. AVERAGE RESULTS FOR FOUR YEARS, 1928-29 TO 1931-32.

Manure per Acre.	Average Tonage.	Average Percentage Increase.
	T. C. Q.	%
1. Super., 3 cwt.	6 17 0	41
2. Super., 6 cwt.	7 4 0	50
3. Super., 9 cwt.	6 11 0	36
4. Super., 6 cwt., sulph. pot., 1 cwt.	6 14 0	39
5. No manure	4 16 0	..
6. Super., 6 cwt., sulp. amm., 1 cwt.	7 12 0	58
7. Super., 6 cwt., sulp. amm., 1 cwt., sulp. pot., 1 cwt.	7 2 0	47
8. Market garden, 6 cwt. ..	5 15 0 (3 years only)	36
9. Basic phos., 6 cwt. ..	5 11 0 (3 years only)	32

Beech Forest Plots. Centre Rows unmanured; on right, super. and ammon. sulph.

Summer Pruning of the Vine

(*Continued from page* 448.)

may be expected on vines not adequately protected by spraying. Black Spot and Downy Mildew can be prevented—they cannot be cured. The spray must precede infection. My earnest advice to growers is to spray early, and spray thoroughly with Bordeaux mixture, and, above all, not to await the appearance of disease before spraying.

Potato Disease Control

Effects of "Seed" Treatment

By D. B. Adam, B.Agr.Sc., Plant Pathologist

DURING the 1928-29 season there was more than the usual amount of disease in the potato crops at Koroit. Several diseases, undoubtedly, were present, including that caused by the fungus *Corticium vagum,* and known as *Rhizoctonia* disease. In order to ascertain the best control measures for this disease a series of plots was established on several farms in the Koroit district.

Most growers are familiar with the dirt-like specks occurring on tubers, and which will not wash off. These dark-brown to black coloured, flattened and shot-like particles are called sclerotia. They constitute the dormant or *Rhizoctonia* stage of the fungus *Corticium vagum,* and are the means by which the fungus over-winters and is transported from place to place. It is this stage of the fungus growth that "seed" treatment is designed to destroy.

Young potato sprouts attacked at their tips by the fungus* Corticum vagum. *Secondary sprouts are arising from beneath the dead tips and at X sclerotia of the fungus can be seen.

If an untreated tuber bearing sclerotia is kept in a moist place at a suitable temperature, such as exists in moist soils during the spring, the fungus, in common with the tuber itself, starts to grow. If conditions remain favorable it may attack the tips of the young sprouts and kill them. The plant may send out a fresh sprout lower down on the same stalk which again may be attacked or destroyed, this process being repeated as long as favorable temperatures and moisture conditions exist. Thus a succession of four or five shoots, each smaller and weaker than the last, may be destroyed.

In the field above ground, these events result in delayed emergence or even in a complete failure to appear, in other words there is a "miss." Sometimes the young plant survives this early period to be attacked later, when symptoms of typical "collar rot" appear. The affected region of the stalk just below soil level turns brown, and is at first water-soaked, though later it becomes dry and cracked. This phase of the disease appears to be capable of developing in plants up to quite a late stage in their growth. Obviously it must interfere in some degree with the normal development of the plant. Such interference is probably best reflected in the field by the decreased yield.

The injury to the collar is accompanied in some cases by symptoms in the above-ground parts. The most definite symptom that has been assigned to this collar rot is an inward rolling and a reddish to purple discoloration of the young leaflets, especially in the latter parts of the growing season. The texture of

the leaves is quite distinct from that found in the disease "leaf-roll," the leaves being soft and generally somewhat wilted; the discoloration varies a good deal with the variety affected.

Later in the season if favorable conditions ensue, especially as regards moisture, the fungus enters upon another phase of its activity. The delicate threads of the fungus grow a short distance up the stalk above ground level, and there produce a greyish-white felt-like mantle around the stalk and the bases of the branches. This is the reproductive phase of the fungus, and is sure evidence of the presence of *Rhizoctonia* disease in a crop. Later in the season when conditions are favorable the fungus may grow from the infected stalk and stolons to the tubers, whereupon they produce the sclerotia already mentioned.

There appear to be other ways in which the fungus may affect the tuber, one of which was important under the cool seasonal conditions existing at Koroit during the earlier part of the 1928-29 season when the early crop was maturing. In this case the affected areas developed as small, round, dark-brown, slightly depressed spots on the surface of the tubers. The surface of the spots was dry and hard, but underneath these occurred a small pit of loose tissue, dry and permeated by the fungus. Growers at the time expressed the opinion that similar spots developed in stored potatoes, but the contention has not been further examined.

Numerous published reports show that the disease can be controlled wholly or in part by dipping seed, before planting, in various chemical solutions; for this reason the trials reported below were instituted. The main index of the value of the different treatments tried has been the increase in yield over comparable but untreated samples. This result is, of course, a most important one from the economic point of view, but without more direct evidence we cannot say how much of any benefit derived is due to *Rhizoctonia* disease control; how much to the control of other diseases, or how much to a stimulation of the tuber seed piece itself. Steps were not taken to study this particular problem in any detail, though by the selection of suitable seed and by other means efforts were made to show that differences which might be due to the relative control of *Rhizoctonia* disease by the different treatments would be brought out, and differences due to other causes reduced to a minimum.

Experimental Trials.

In the field plots established on private farms at Koroit the varying effects of seed treatments on yield were the main questions determined. Although quantity is the most important one from the grower's stand-point, the value of the results obtained in *Rhizoctonia* disease control has limitations which have already been shown. From the preceding account of the disease it is evident that the only way to determine the influence of seed treatment on the disease itself is to dig up representative samples from plots differently treated, and examine the plants for evidence of disease. This was done on a limited scale at Burnley during one year; the results are set out in Table . In addition to the yield figures obtained at Koroit, figures showing the number of "misses" per plot were secured.

During the first season trials were conducted on six farms, in the two subsequent seasons they were confined to three of these six. Certain experiments were maintained throughout the three seasons; others detailed below were carried through for one season only.

With the exception of the hot formalin tests which were given at the Werribee Research Farm all treatments were carried out on the private farms concerned. For experiments in which corrosive sublimate was used wooden containers were employed. Most of the solutions were used only once, in no case were the corrosive sublimate solutions, which with sustained use are known to deteriorate in strength, used more than twice. Sufficient quantities of each solution were used to dip at one time the whole requirement for each treatment on each farm.

In the first season treatments were applied on an average ten days before planting; in the second year the potatoes on Farm (F) were treated the day before planting; in the other two cases a delay of three weeks took place. In the third year treatments were applied five or six weeks before planting. The object of allowing a period to elapse between treatment and planting is to avoid the delay in sprouting which, American writers claim, otherwise occurs. No definite steps were taken with the view to testing this belief, though observations suggested that certain treatments, e.g., Germisan, would have this affect in a greater degree than would others. In these cases, however, the effect of delayed emergence soon disappeared. On the whole the material

used in the treatment appeared to have a more important effect than the time elapsing between treatment and planting. Whole tubers were treated, usually the day before they were cut, and the sets so obtained planted.

During the experiment attention was paid to laying out the plots in such a way that it would be possible to estimate whether the differences in the yield between the several plots was a difference due probably to the merit of the treatment rather than to a lucky placing of plots in the field. In the first season a system of plots consisting of a single row 5 chains long was used, each treatment being represented by six plots. During the second and third year a Latin square system, devised by Messrs. Forster and Vasey, of the State Research Farm, Werribee, was used on one or more of the farms. The details of this arrangement can be gathered from the accompanying plan. Where this system was not adopted plots 4 and 5 chains long, and one or more rows wide were used. The plots were planted by hand by experienced planters, and although no special steps were taken to ensure that the same numbers of "sets" were planted in all plots, the variation in this direction was small.

The results for yield for the first season are based on plots a single row wide and 1 chain long; in the second and third season plots two rows wide and 1 chain long constituted the plot. The "percentage misses," except where indicated to the contrary, are based on counts made at a time when further fresh growth from the seed tubers could not be expected. The plots were established on land that had grown potatoes for 40, 50, or more years off and on, but in no case had potatoes been grown within three years prior to the establishment of the plots. In most cases grass established for a number of years was growing on the ground prior to its being broken up for the test.

Results.

Effect of Treatments on Yield.

In Table I. is given a summary of the yields for each treatment. The figures given are average total yields in cwts. per acre and are based on plots the size of which has already been indicated.

TABLE I.

Farm.	Date Planted.	Variety.	A.	B.	C.	D.	E.	F.	G.	Mean.	S.E.	D.
			cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
A	17.7.29	Pinkeye ..	107·9	112·0	..	..	..	95·0	105·0	..	..	..
B	16.7.29	Pinkeye ..	32·7	28·0	..	..	..	23·7	12·5	24·2	..	..
C	20.6.29	Pinkeye ..	89·5	109·5	..	..	..	93·8	68·0	90·2	..	..
D	21·8·29	Pinkeye ..	69·5	96·0	..	..	..	76·5	75·0	79·2	..	..
E	26.7.29	Carman ..	172·2	188·2	..	..	..	160·6	168·8	170·9	..	..
F	21.11.29	Snowflakes ..	264·6	249·6	..	..	..	276·2	232·6	251·0	..	..
E	21.8.30	Carman ..	233·0	238·0	228·0	231·0	..	..	200·0	226·0	2·86	19·2
F	29.6.30	Pinkeye ..	97·7	97·5	95·0	99·4	..	..	94·6	93·8	..	..
D	20.8.30	Pinkeye ..	68·7	66·4	63·7	68·2	..	..	62·4	64·9	..	..
F	24.11.31	Snowflakes ..	234·8	234·4	226·1	232·8	237·2	..	221·6	231·1	1·72	10·8
D	16.12.31	Snowflakes ..	102·0	106·2	60·6	66·6	112·2	..	116·6	94·0	..	..
E	7.12.31	Carman ..	109·2	141·6	99·0	117·6	123·6	..	115·2	117·7	..	..
Averages—untreated = 100.*			107·4	113·2	93·8	100·6	104·3	109·7	100·0	..	..	..

Legend.

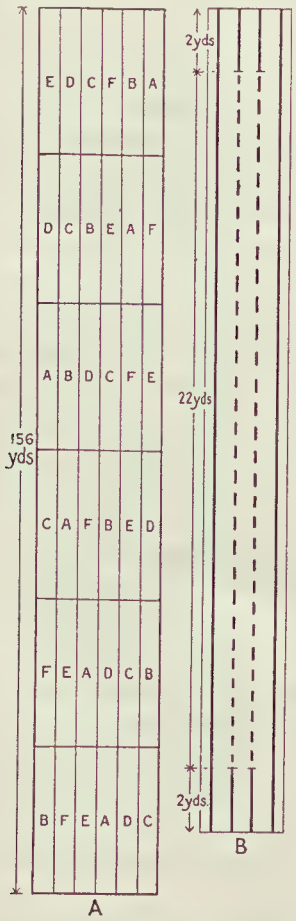
Treatments A.—Corrosive sublimate 1–1,000 (1 oz.—6¼ gallons) for 1½ hours.
" B.—Formalin solution 1 lb.—30 gallons for 1½ hours.
" C.—Formalin solution 1 lb.—15 gallons for 1½ hours.
" D.—Corrosive sublimate 1–500 (2 ozs.—6¼ gallons) acidulated with commercial hydrochloric acid to make a 1 per cent. solution—for 5 minutes.
" E.—Germisan ¼ per cent. solution for 15 minutes.
" F.—Hot (112° Fahr.) formalin solution 1 lb.—30 gallons for 3 minutes.
" G.—No treatment.

S.E.—Standard error of any one result. It is a figure derived from the figures from yield and arrived at by mathematical calculation. It affords a measure of the unavoidable error due to such things as soil variation.

D.—Difference required to indicate significance. Where the yield figures for different treatments differ by this amount or by more it is a strong indication that the higher yield was due in part to the advantages of treatment and not alone to such things as favorable conditions of soil accidentally encountered in the field.

* The figures given against averages, untreated=100, have been derived from the figures in the main part of the table. For the purpose of this average all the figures for one treatment and corresponding figures in the controls have been taken and an average for each struck. The figures for the control were then reduced to 100 and the figure for the treatment by proportion.

From Table I. it is clear that treatment with cold formalin solution 1 lb. to 30 gallons has led to a small but definite increase in yield. The average increase for 66 plots treated in this way is approximately 13 per cent. The increase is small, but no doubt significant, for of the twelve series of plots spread over three years using three different varieties, in only one instance was the yield less than from the control plot of untreated seed. Further, in the two cases where the results have been subjected to a mathematical analysis, the actual increase in yield of the plot treated with formalin 1-30 over that of the untreated is greater than the difference required to indicate significance.



Plan of Plots on Farm F showing system of arrangement.

A is a general plan, while B shows a single plot—only that part of the rows shown by the dotted lines is harvested for yield. In the general plan the various treatments are represented by the letters A, B, C, D, E, and F.

The average figures show that the increases with other treatments are less. In three cases out of twelve the treatment with corrosive sublimate did not give better results than those from untreated seed, though in the two cases where it was possible to examine the significance of the difference between two treatments, the results positively indicated that the corrosive sublimate treatment was beneficial. The average yield figure for the trials with hot formalin was a little higher than from those with corrosive sublimate, but the number of trials was less, and thus the opportunity for examining the significance of the figures was not so good. This treatment and that with an acidulated solution of corrosive sublimate were included for the reason that the time required for both treatments is relatively short. The hot formalin treatment was dropped after the first season as proper facilities for the heating required were not readily available. The acidulated corrosive sublimate treatments, with one exception, gave increases of yield over the untreated seed. In the exceptional case there was other evidence to show that the diminished yield was due to seed piece injury under the particular conditions of the trial. If this case be neglected the increase of yield obtained is in all aspects comparable with that obtained with corrosive 1-1000 for 1½ hours.

Germisan ⅛% for 15 minutes was tried only during the last season it gave a small increase which in the instance where a detailed examination was made was significant.

From the results it is concluded that with potatoes carrying an average proportion of *Rhizoctonia* sclerotia, and grown at Koroit, treatment with a cold formalin solution of 1 pint to 30 gallons for one and a half hours may be expected to give a 10% increase of yield over untreated seed.

Misses.—In the description of *Rhizoctonia* disease it was pointed out that one of the first symptoms of this disease is an attack on the young developing shoots. If the attack be sufficiently maintained it will result in a "miss." Besides this, there are, of course, other diseases causing "misses" which may or may not be affected by seed treatment. In Table II. data obtained in regard to "misses" are presented.

For purposes of comparison the figures for "misses," which refer to the same plots as those described in Table I., are expressed in terms of percentage of the total sets planted.

TABLE II.

Farm.	Date.	Variety.	Treatment.						
			A.	B.	C.	D.	E.	F.	G.
A	17.7.29	Pinkeye ..	20	18	..	..	..	20	21
B	16.7.29	Pinkeye ..	39	40	..	..	..	45	64
C	20.7.29	Pinkeye ..	49	47	..	..	..	48	51
D	21.8.29	Pinkeye ..	35	31	..	..	..	34	35
E	26.7.29	Carman ..	3	3	..	..	..	5	6
F	21.11.29	Snowflakes ..	4	4	..	..	..	22	6
E	21.8.30	Carman ..	7	9	8	11	..	..	12
F	29.6.30	Pinkeye ..	4	4	3	4	..	..	6
D	20.8.30	Pinkeye ..	4	4	3	5	..	..	6
F	24.11.31	Snowflake ..	9	10	11	11	10	..	11
E	—.12.31	Carman ..	11	14	26	11	7	..	15

NOTES.—For explanation of treatments A, B, C, D, &c., see Table I.
Owing to very dry weather at planting time, and for some time after, and to unfavorable soil conditions, the early growth of Snowflakes on Farm D for 1931 (see Table I.) was very erratic. The figures obtained reflect this fact only, hence they are not given here.

It is of interest to observe that the reduction of "misses" over the whole series is, with the cold formalin treatment, of the same order, viz.—10% as the increase in yield, although it is clear that "misses" may result from causes other than those which are influenced by seed treatment.

Seed Injury.

Practically all the treatments were effected in containers that held approximately one bag of potatoes, care being taken to ensure that the conditions of treatment as outlined were followed closely. Generally the immersion caused no injury to the tubers, but the figures for "misses" suggest that in two particular cases there was some such injury. Snowflakes planted on 21st November, 1929, in common with other varieties, were treated with hot (112° Fahr.) formalin, 1 pint to 30 gallons, at the Werribee Research Station, and later forwarded to Koroit ten days before planting. When counted for "misses," 22% was found in this plot as compared with 6% for untreated and 4% for other treated lots. At the time no ill effects of the treatment on the tubers themselves was noticed.

In a second case in 1931-32 where Carmans were treated with cold formalin 1 pint to 15 gallons, and on the following day carted to the farm where they were planted a month later, the treatment resulted in seed injury. This was noticeable in the tubers themselves at planting time, and is reflected in the figure for "misses" given in Table II., viz.:—26% as against 15% in the untreated controls. A similar injurious effect was inflicted on Snowflakes used in Plot (11) planted about the same time. The injuries to the tubers were observed, but for reasons explained elsewhere figures for "misses" in the plot are not recorded.

On occasions the acidulated corrosive sublimate treatment was observed to produce slight tuber injury, but this is not reflected in the figures for "misses" at Koroit. In experiments at Burnley, however, a great many "misses" were attributable to seed injury by acidulated corrosive sublimate treatment.

Miscellaneous Trials relating to Rhizoctonia Disease.

(1) *Soil Infestation.* — The fungus that causes *Rhizoctonia* disease appears to be capable of remaining in the soil for a number of years. Therefore the disease may be contracted either from the fungus already established in the soil or by its introduction with the seed. While treatment may exercise some influence on the seed-borne fungus, it obviously cannot influence infections of the stem parts that arise from the fungus established in the soil.

With a view to throwing some light on the process of soil infestation, some tubers apparently free from infection with the *Rhizoctonia* were selected. One-half of them was treated with corrosive sublimate 1-1000 for 1½ hours; the other half was planted untreated. The experiment was carried out with early and mid-season planted "Pinkeyes" and late planted Snowflakes. Table III. shows the results obtained.

Table III.

Date. Planted.	Variety.	Corrosive Sublimate, 1–1000 for 1½ Hours.				Untreated.			
		Unselected.		Selected.		Unselected.		Selected.	
		Per cent. Misses.	Yield cwt./ac.	Per cent. Misses.	Yield cwt./ac.	Per cent. Misses.	Yield cwt./ac.	Per cent. Misses.	Yield cwt./ac.
16.7.29 ..	Pinkeye ..	39	28·0	45	28·5	64	12·5	45	25·7
21.8.29 ..	Pinkeye ..	35	69·5	26	80·5	35	75·0	30	88·5
21.11.29 ..	Snowflakes ..	4	264·6	2	248·4	6	232·6	11	232·8

A detailed examination of the progeny of the Snowflakes for evidence of *Rhizoctonia* sclerotia was made with the results shown in Table IV.

Table IV.

—	Corrosive Sublimate.		Untreated.	
	Unselected.	Selected	Unselected.	Selected.
Percentage Clean Seed ..	5·3	35·4	1·2	1·0

From the results it is apparent either that infection of the tubers arising from soil infestation is high or that the corrosive sublimate treatment is not very effective, but evidence opposed to this second alternative is given later. In the second place it is certain that there is no clear relationship between the development of *Rhizoctonia* sclerotia on potatoes and the yield of the parent plants.

It will be noted that the percentage of clean tubers in selected untreated seed was much smaller than that from similar potatoes treated with corrosive sublimate. If the large difference is a real one it shows that, despite the care taken in selecting tubers free from *Rhizoctonia* sclerotia, such selection was not successful in obtaining disease-free seed. The bulk of the high percentage of misses in both lots of Pinkeyes apparently was not due either to the incidence of *Rhizoctonia* disease or to seed treatment, but to other causes.

(2) *Stem Infection.*—It has been pointed out that the fungus causing the *Rhizoctonia* disease may attack the stem of the plant just beneath ground level bringing about a collar rot. It is believed that this disturbance, together with reduction of stand, is the chief means by which a reduction of yield is brought about.

To obtain information on "collar-rotting," plots of four rows with 165 sets per row were planted at Burnley Gardens. The potatoes for these plots were Carmans carrying abundant sclerotia. They were treated in a similar way to those grown at Koroit. The potaties were sown on the 3rd November, 1930, a fortnight after treatment, between fruit trees on land that had not previously grown potatoes. The chance of soil infestation with *Rhizoctonia* therefore was small. Data were obtained concerning "misses" and also collar rot by digging up the individual plants. It was our intention to make these diggings at regular intervals, but in the second digging, which was to be made in January, the diagnosis of the disease became so uncertain that digging was discontinued. Table V. records the data obtained.

Table V.

—	Treatments.				
	A.	B.	C.	D.	G.
Per cent. misses	7	7	4	30	3
Per cent. of total plants on 16.12.30 affected by *Rhizoctonia* collar rot ..	1	18	20	1	71

Treatments A, B, C, D, G, similar to those in Table I.

From Table V. it is clear that the treatments, corrosive sublimate (1-1000 for 1½ hours (and acidulated (1% HCl) corrosive sublimate (1-500 for five minutes) have markedly reduced the number of collar rot infections. The formalin treatments also led to a reduction in the amount of collar rot subsequently developing, but in this respect both are

less efficient than the seed dips containing corrosive sublimate. Some of the sets which had "missed" were recovered, but in no case was there evidence to show that the failure to emerge was due to attack by *Rhizoctonia*. In the case of the treatment with acidulated corrosive sublimate a considerable proportion of the misses undoubtedly was due to seed injury, as some of this was observed at planting time. The injury may have arisen through failure to dry off treated tubers sufficiently rapidly after treatment.

Acknowledgments.

The Department is indebted to Messrs. W. J. Anderson, J. J. Gleeson, D. Lane, Sheen Bros., A. Skilbeck, and J. Wilkinson for facilities for carrying out the trials in 1929-30, and to Messrs. Anderson, Sheen Bros., and Skilbeck for a continuance of these facilities in the two subsequent seasons.

Summary.

The treatment of *Rhizoctonia*-affected potatoes with cold formalin solution, 1 lb. to 30 gallons of water, for 1½ hours, resulted in an average increase of yield of 13 per cent.

Corrosive sublimate, 1 oz. to 6¼ gallons, for 1½ hours, also resulted in an increase in yield, but it was somewhat less than that obtained with formalin.

Treatment with acidulated corrosive sublimate, 2 oz. to 6¼ gallons of water for 5 minutes, and Germisan, 2 oz. to 10 gallons for 15 minutes, gave indications of values equivalent to the corrosive sublimate treatment, but the tests were scarcely extensive enough to prove this point definitely.

Treatment with acidulated corrosive sublimate, while it lessens considerably the time required for treatment, is open to the objection that there is a risk of seed injury. The use of too strong a formalin solution may also cause seed injury in delicate seed stocks. Under the conditions of the trial where the potatoes were dried soon after treatment the other treatments did not result in seed injury.

There is evidence to show that the effect of treatment was due in part to a diminution in the number of "misses" in a crop, and partly to a control of the collar rot brought about by the *Rhizoctonia* fungus.

At the same time it should be mentioned that a variable, often large, proportion of the "misses" occurring at Koroit was unaffected by seed treatment.

An experiment carried out in 1929-30 indicated that in a Koroit potato field managed in a reasonable way the soil infestation with *Rhizoctonia* was high.

An experiment conducted at Burnley in 1930-31 indicated that treatment of potatoes bearing *Rhizoctonia* sclerotia with dips containing corrosive sublimate was highly efficient in the control of collar rot. Formalin solutions were less efficient in this respect.

Farm Produce Agents.

List of Licences issued subsequent to the 18th March, 1932, and up to 25th May, 1932.

Name of Licensee.	Court where Issued.	Name of Licensee.	Court where Issued.
Barker, Green, and Parke Pty. Ltd. ..	Bunyip	Henley and Fairman	Nathalia
Bayfield, Edwin H.	Melbourne	Lewthwaite, J. D.	Melbourne
Brazel, Alphonsus Joseph	Camperdown	McMurray, Bertram Reginald ..	,,
Chenoweth, John	Kew	Nicholas, E. (Wm. Bruce Nicholas, trading as)	,,
Davis, Geoffrey Barnett	Caulfield	Rice Bros.	,,
Dixon, David Norman	Melbourne	Rogers, George Vining	,,
Downey, James	,,		

Previous list printed in this *Journal* for April, 1932.

Orchard and Garden Notes

By Edward E. Pescott, F.L.S.

The Flower Garden.

MANY spring-flowering shrubs will now be coming into bloom. These include Deutzia, Philadelphus (Mock Orange), Weigela, Spiraea, and others. As soon as they have finished flowering, they should be pruned, by cutting out the old stems, by thinning the crowded growths, and by trimming the bushes into a regular shape. The plant must then be well manured with a garden manure mixture, or with any of the animal manures.

Sowings of all summer-flowering annuals should now be made. Included here are phlox, aster, sunflower, cosmos, zinnia, balsam, tithonia; some of the perennials, such as delphinium, may also be sown.

The seed should be scattered in very light sandy soil, and in a sunny place, and some dead leaves or some very old stable manure rubbed and crumbled into a loose powder should be sprinkled on the top of the seed-bed. This gives the coolness and shade that is required to protect the germinating seed.

As soon as the seedlings have three or four leaves they may be transplanted to the garden borders.

Seedlings and herbaceous plants should be protected from slugs, snails, and slaters by using the lime-arsenate remedy. Nine parts by measurement of bran is mixed with one part of calcium arsenate. This is first damped over with sugared or treacle-flavoured water. The mixture is then scattered about the garden among the plants. It should not be wet enough to make baits or lumps, but loose and free, almost like the original bran itself.

The Orchard.

The Codling moth will soon be making its presence felt in orchards, and spraying to combat it is now essential. The calyx spray is most important, and as soon as the petals begin to fall this should be given. The usual spray is composed of 2½ lb. arsenate of lead powder, ½ lb. casein spreader, 10 pints white oil to 80 gallons spray. Later sprays to be given at regular monthly intervals as required should consist of a similar mixture with a reduced quantity of oil—about 4 pints instead of 10.

Deutzia.

The presence of San José scale in many districts should cause all growers to keep a watch on their trees. The oil sprays mixed with the Codling spray will be a deterrent if the infestation is slight; but if the scale is abundant, then a stronger white oil spray or a lime sulphur mixture should be used.

The Vegetable Garden.

Sowings of French beans for early crop may now be made. The seed should be well dusted with lime or with Cliff's insecticide to check the attacks of soil insects.

Cape Gooseberry seeds may now be sown. This plant likes a very rich soil, and a sunny situation. The common Cape Gooseberry grows as a low bush, and usually lasts for two seasons. It bears its best crop in the second year. The trailing variety is an annual, and produces a large quantity of fruits. This is the best flavoured of the three varieties. The Golden Nugget yields very large fruit, often 1½ inches in diameter. This is not a dessert variety, and the fruit is used solely for jam and jelly.

Professional Papers

[This section is devoted to professional papers and articles of a scientific character.]

Studies of Growth and Fruit Bud Formation

No. II.—A Year's Observations on Victorian Pears (1) (2)

By C. Brenard, M.Sc., Botanist, Division of Plant Industry, C.S.I.R., and
Frank M. Read, M.Agr.Sc., Senior Horticultural Research Officer, Department of Agriculture, Victoria.

IN the first article of this series the relation between vegetative growth and fruit bud formation was discussed; and a brief summary was given of horticultural research upon the general problem of tree productiveness from this point of view. The importance of knowing in any fruit-growing district, the time of differentiation of the fruit bud, and its subsequent development until the tree blossoms in the following spring was pointed out; and likewise the necessity for an accurate study of the vegetative growth throughout the year. It was suggested that without such data it is not possible adequately to discuss tree performance nor to apply at the proper time field measures having as their object the encouragement of greater fruitfulness. A year's observations on fruit bud development and tree growth in several varieties of Victorian apples were recorded in the first article, and their significance discussed.

In the present communication the time of differentiation and subsequent development of the fruit buds of the William Bon Chretien Pear in two representative Victorian districts during season 1930-31 are recorded, together with observations on the progress of vegetative growth of the trees. Since each of these characters may be expected to vary not only from one district to another, but also from season to season, the continuance of such studies over a period of years is desirable.

The time of the initiation of the blossom bud of the pear has been determined in several States in the United States of America, in Sweden and in Holland as shown in Table I

TABLE I.

Variety.	Differentiation First Noted.	Locality.	Investigator.
Wilder Early	July 21, 1899	Wisconsin	Goff (3)
Wilder Early	Sept. 6, 1900	Wisconsin	Goff (4)
Kieffer ..	July 15, 1909	Virginia	Drinkard (2)
Bartlett* ..	July 3, 1915	California	Henderson (5)
Bartlett ..	July 4, 1922	California	Wiggans (9)
Bartlett ..	June 21, 1923	California	Tufts and Morrow (8)
Beaurré Hardy	Aug. 24, 1925	Holland	Luyten & De Vries (7)
Gelbe Fruhbirne	End of July, 1928	Sweden	E. Johanssen (6)
Bonne Louise	End of Aug., 1928	Sweden	E. Johanssen (6)

* Better known in Australia as William Bon Chretien.

Though the dates given here may be translated in approximate times under Victorian conditions, the necessity of determining the period for each large fruit-growing district has already been indicated(1).

(1) The first article of this series dealing with observations on Victorian apples appeared in the July issue of this *Journal*. An article dealing with similar studies on the Sultana appeared in the *Journal of the Commonwealth Council for Scientific and Industrial Research*, Vol. 5, No. 10 (3).

(2) This work has been carried out by the Council for Scientific and Industrial Research, and the Department of Agriculture, Victoria, in co-operation. The selection of varieties, the sampling of material, and the observations on tree behaviour have been made by the Victorian Department; whilst the C.S.I.R. has carried out the microscopical examination of the buds, and the preparation of the photomicrographs.—[ED.]

(3) The numbers in brackets throughout the text refer to the works of reference cited at the conclusion of the paper.

Source of Material and Technique.

William Bon Chretien pears from two Victorian districts, Templestowe and Shepparton, have been used for this study. The William Bon Chretien is by far the most important pear grown in Victoria. The southern areas near Melbourne, of which Templestowe is typical, are non-irrigated except to a limited extent from small dams; while Shepparton is representative of the Goulburn Valley irrigation areas. Shepparton is over 100 miles north of Melbourne; and has a much warmer summer climate.

The fruit buds of the pear like those of the apple are borne in three main positions:—

1. On the current season's wood, particularly the terminal buds.
2. As terminal buds of new spurs on two-years old wood.
3. As terminal buds of fruit spurs more than two years old.

In the southern pear-growing areas it is customary to prune mature pear trees so that the crop is borne principally on old spurs. In the irrigation areas of the north, on the other hand, growth is usually more vigorous, the trees are pruned much more lightly, and much of the crop is borne in the first two positions, particularly the second.

The buds selected for study at Shepparton, therefore, were terminal buds of new spurs on two-years' old wood. At Templestowe the same class of buds was sampled to enable a direct comparison to be made between the two centres, and despite the fact that in the southern areas the third class is the more important. There is reason to believe, however, that the times of differentiation and subsequent development of these two classes are similar.

The technique employed in the collection of samples and the microscopical examination of the buds was similar to that used previously in the case of apple buds (1). The greater part of the material was examined by means of dissections made at a magnification of 50 to 100 diameters; and this method proved most suitable in the study of the early stages of development. Material was also embedded in paraffin in the usual way and sections cut at a thickness of 10μ. These were stained in safranin and found most useful in the examination of the later stages of development, i.e., in material collected during autumn and winter.

Growth of Trees.

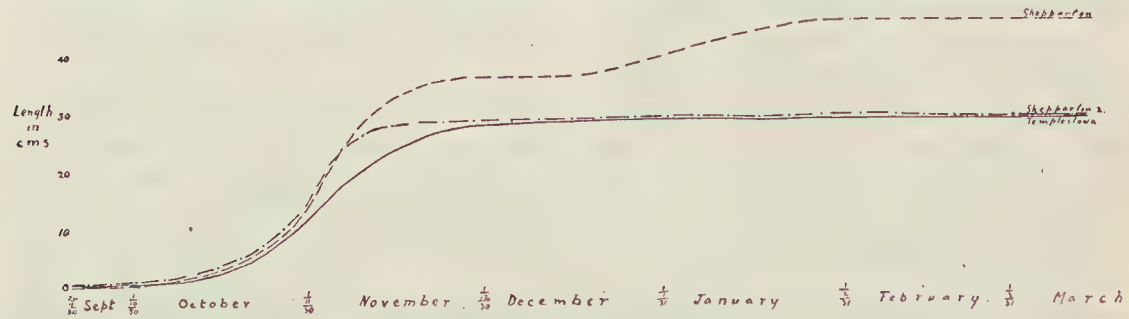
As in the case of apples (1) growth measurements of the trees in both localities were made periodically throughout the year. The main features are summarized in Table II., and need little explanation.

TABLE II.

Details of Growth of William Bon Chretien Pear at Shepparton and Templestowe, Victoria, Season 1930-31.

	Shepparton.	Templestowe.
Bud Burst	Sept. 20th	Sept. 23rd
Full Bloom	Oct. 5th ..	Oct. 8th
Spur Leaves Mature ..	Nov. 14th	Nov. 21st
Shoot Elongation ceased	Dec. 1st ..	Dec. 12th
Second growth commenced	Dec. 22nd	Nil
Second growth ceased ..	Feb. 1st ..	Nil
Crop mature	Feb. 1st ..	Feb. 15th
Defoliation commenced ..	May 25th ..	May 1st
Completed	July 30th ..	June 30th

The warmer northern district, Shepparton, is somewhat earlier in growth and crop maturity than Templestowe, although not much earlier this year in leaf burst or blossoming. Leaf fall is seen to be much earlier in the cooler district. In Graph I. is illustrated the progress of growth of typical current season's laterals. This is not intended to be interpreted quantitatively, but



Graph I.—Showing growth of one-year old lateral shoots of William Bon Chretien Pear at Shepparton and Templestowe, season 1930-31.

merely indicates the type of growth made and the approximate times. A much greater number of shoots would have to be measured before any reliable quantitative estimate of tree growth in the two districts could be made.

At Shepparton shoot elongation had ceased on 1st December, while at Templestowe it was nearly a fortnight later. Late in December, however, at Shepparton a second growth occurred from the terminal or, more generally, the sub-terminal buds of approximately 30 per cent. of the new laterals, and continued until the beginning of February. This is illustrated in the curve marked "Shepparton 1." The remainder of the shoots are typified by "Shepparton 2." No such second growth of laterals of pears occurred at Templestowe, although a similar phenomenon was noticed in certain apples in this district (1). Unfortunately, no details of diameter increase of pears are available, and it is not therefore possible to investigate the correlation between length, growth, and thickening of the older wood.

In the case of apples (1) this second growth period was shown to coincide with a temporary cessation of diameter increase, and the possible significance of this relationship was discussed.

Bud Development.

(a) Organization of the Terminal Mixed Spur Bud.

The flower bud of the pear is a "mixed" bud like that of the apple, since it produces not only an inflorescence of flowers, but a cluster of leaves as well. It is composed, by the end of January, of 28 to 30 leaf formations inserted spirally on a very short axis. The axis is terminated by a flower, and flower primordia are situated in the axils of the upper ten or twelve leaf formations. At this time all the parts of the bud have been formed, and the primordia of the flowers are present. It is not until late autumn, however, that the plumpness of the mixed buds distinguishes them macroscopically from the leaf buds.

The leaf formations are differentiated as follows:—The outer ten or twelve are hard protective structures known as bud scales. These are followed in sequence by two to three transitional leaves, five to seven foliage leaves, and eight to nine bracts.

The outer bud scales are short and triangular with a broad and thickened base. They are glabrous and very often slightly trifid. The inner scales are ovate lanceolate in shape, thinner and lighter in colour, with long stiff hairs covering the dorsal (inner) surface.

The transition leaves are tripartite, and are distinguished from the bud scales by this feature. The stipules are longer than the lamina, and the whole leaf is covered by long brown hairs, which are particularly dense on the dorsal surface.

The transition between bud scales and foliage leaves is more gradual in the pear than in the apple. The outer transition leaves are very scale-like, whilst the inner ones closely resemble the outer foliage leaf rudiments. It was very often difficult to determine which formation represented the first leaf.

The foliage leaves are tripartite, but are different in shape from the transition leaves, being narrower and possessing a lamina as long as or longer than the stipules. They are also less hairy. The bracts differ from the foliage leaves in that they are lanceolate in shape, possess no stipules, and are also more hairy.

The bud scales and transition leaves bear nothing in their axils, but the first two foliage leaves subtend vegetative points, which form the buds responsible for the branching of the spur. In the axil of each of the upper foliage leaves, and of the bracts, a flower primordium is produced; each primordium being accompanied by two bractlets as in the apple (1).

The flower which is produced from the apex of the axis develops first, and during the early part of the season is more advanced than the axillary ones.* In the case of the latter the development of the basal primordia precedes that of those situated in the axils of the upper bracts. The terminal flower maintains its dominance until about the end of May. The lower axillary flowers then begin to develop more rapidly, and during June, July, and August are more advanced than the terminal or upper axillary florets.

Primordia arising in the axils of the foliage leaves and lower bracts occasionally form more than one flower. The primordium differentiates in the usual way into a flower primordium proper and two bractlets, but a

* Luyten and De Vries (1926) found that "the terminal flower is formed about one month later than the second flower from the bottom." Drinkard (1909–10) infers from the evidence of sections that the terminal flower is the oldest.

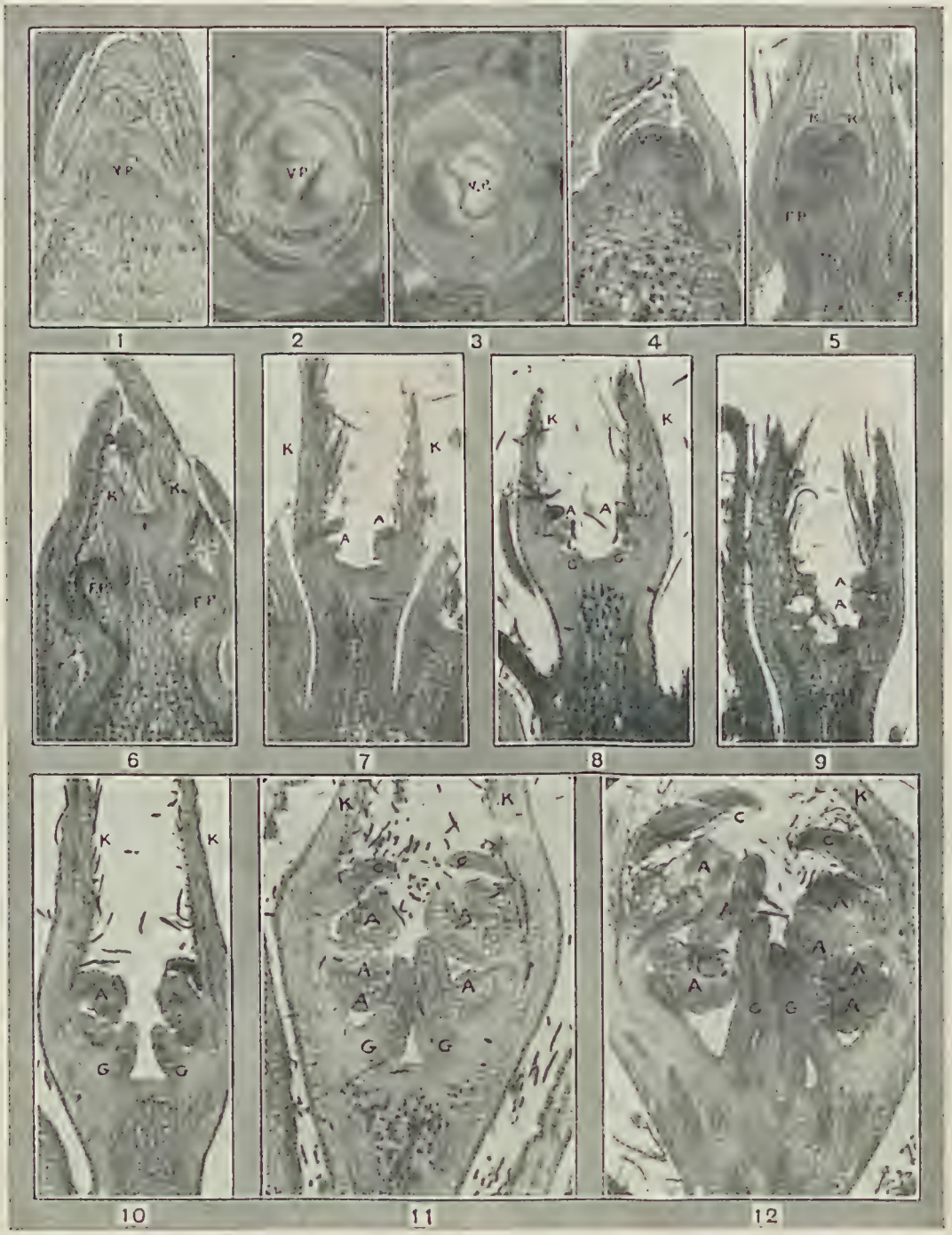


Plate I.—Blossom Bud Development in the William Bon Chretien Pear, Shepparton, Victoria (magn. x 50).

KEY: VP, Growing point; K, Sepals (calyx); FP, Flower primordia; A, Stamens (androecium); G, Carpels (gynaecium) and C, Petals (corolla).

growing point then arises in the axil of each of the bractlets. These growing points constitute the primordia of secondary flowers which are axillary to the bractlets (which must then be termed bracts). A similar, but not so well marked, tendency towards a dichasial ramification of the inflorescence has been noted in the apple.

(b) Differentiation and Development.

Stage I.—During November and prior to the time of differentiation the growth of all spur buds is similar, and consists of the splitting off of leaf formations from the growing point. No differences can be detected which distinguish potential leaf buds from potential mixed buds. The axis of the bud is short, and the growing point flat and inconspicuous ("V.P.," Fig. 1, Plate 1).

Stage II.—The first indication of differentiation is seen in an elongation and broadening of the axis in the region of the crown, which is accompanied by an enlargement and elevation of the growing point itself† ("V.P.," Figs. 2 and 3, Plate 1).

The axis elongates rapidly splitting off bract initials from the growing point, and flower primordia appear in the axils of the foliage leaves. The growing point at this time is broad and rounded (Fig. 4, Plate 1).

Stage III.—The apex of the axis flattens preparatory to the formation of the terminal flower, and the primordia in the axils of the foliage leaves differentiate into flower primordia proper and bractlets.

Stage IV.—Sepal initiation takes place in the terminal flower first (Fig. 5, Plate 1).

Stage V.—The formation of petals in the terminal flower is accompanied by the formation of sepals in the lower axillary flowers. The primordia in the axils of the upper bracts at this time have just differentiated into flower primordia proper and bractlets.

Stage VI.—The stamens arise in three whorls. Firstly, an outer whorl of ten is formed and then two inner whorls of five each are differentiated in rapid succession. The sepals are enlarging rapidly and becoming hairy (Fig. 6, Plate 1).

Stage VII.—Five carpels appear as small prominences in a ring at the base of the receptacle. These are seen at G in Fig. 8, Plate 1, and the first indication of their origin is shown in Fig. 7, Plate 1. The stamens show no differentiation into filament and anther.

Subsequent development consists mainly in the growth of the parts of the flowers, and the differentiation of the stamens into filament and anther. By the end of May the terminal and basal axillary flowers reach the stage represented in Fig. 10, Plate 1.

Stage VIII.—Sporogenous tissue can be distinguished in the anthers (Fig. 11, Plate 1). By the end of June the lower axillary flowers had reached this stage, whilst the terminal flower showed very little growth beyond that of the stage illustrated in Fig. 10.

Stage IX.—Loculi then appear at the base of the carpels, and ovules are formed while spore mother cells are developed in the anthers. Fig. 12, Plate 1, illustrates a slightly less advanced state than that referred to. By the middle of August the basal axillary flowers had reached this condition, whilst upper axillary flowers had reached Stage VIII., and the terminal flower was not quite so far advanced as Stage VIII.

The time of the season at which the buds passed through the stages described above is shown in Table III.

Discussion.

Fruit bud initiation in the pear this year seems to practically coincide with cessation of growth of the lateral shoots. It occurs approximately two weeks after the spur leaves have reached full size. Fruit bud development at Shepparton is seen to be a little ahead of that at Templestowe, growth being correspondingly earlier.

The seventh stage (appearance of carpels) was reached by the Templestowe buds in early February. At Shepparton buds of this type were noticeable over a rather protracted period, the end of January to the end of February. It is possible that buds showing Stage 7 by the end of January at Shepparton were from spurs on two-years old wood, the terminal growth of which ceased for the season on 1st December, while the development of buds on two-years old wood at the base of shoots which made a second growth was delayed, as a result of this second growth, up to one month. In the apple (1) the times of differentiation and the dates at which the various stages of development were reached in the Yates variety,

† Luyten and De Vries (1926) also describe the growing point of the undifferentiated bud as *flat* and narrow, and state that the first indication of differentiation is observed when the growing point gets broader and more *convex*. On the other hand, Goff, Drinkard, Wiggans, and Tufts and Morrows, dealing with the pear as well as other investigators in respect to the apple bud, describe the signs of differentiation as a broadening and *flattening* of the *convex* growing point of the undifferentiated bud. A flattening of the growing point does occur just prior to the formation of the terminal flower, but this takes place about three weeks after the stage II., described above.

which made no second growth, were much more concise than in Jonathan and Rome Beauty where protracted late growth occurred.

Summary.

1. Brief reference is made to a previous article(1) in which the general problem is discussed at greater length. The dates of initiation of blossom buds of several varieties of pears in Europe and America are given; but it is necessary to determine them for each large fruit-growing area.

2. The William Bon Chretien pear has been studied in two representative Victorian districts. Templestowe is typical of the southern non-irrigated areas; and Shepparton of the irrigated orchards of the Goulburn Valley.

3. The main features of tree growth are summarized in Table II. and Graph I., and are briefly discussed. The warmer northern district is shown to be somewhat earlier in all stages.

4. The organization of the terminal mixed spur bud of the pear is described; and the initiation and development of its floral parts discussed in detail. These data are summarized in Table III. and Plate 1.

5. Fruit bud initiation occurs in early December in both districts; and is seen to practically coincide with cessation of growth of the current season's shoots. It occurs approximately two weeks after the spur leaves have reached full size.

6. There is some evidence that a second growth period at Shepparton, probably the result of the wet summer, interrupted to a small extent the normal development of the blossom buds.

Acknowledgment.

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TABLE III.

SHOWING THE DATES OF FRUIT BUDS INITIATION, AND DATES AT WHICH THE VARIOUS STAGES OF BUD DEVELOPMENT WERE REACHED.

William Bon Chretien Pears, Season 1930-31.

Locality.	Stage 2. Differentiation.	Stage 3. Axillary Primordia.	Stage 4. Sepals Terminal Flower.	Stage 5. Petals Terminal Flower.	Stage 6. Stamens Terminal Flower.	Stage 7. Carpels Terminal Flower.	Stage 8.		Stage 9.	
							Terminal Flower.	Basal Axillary Flower.	Terminal Flower.	Basal Axillary.
Shepparton (Victoria)	1st week in Dec.	3rd week in Dec.	End of Dec.	2nd week in Jan.	3rd week in Jan.	End of Jan. End of Feb.	Mid Aug.	End of June	..	Mid Aug.
Templestowe (Victoria)	Beginning of Dec.	..	1st week in Jan.	Mid Jan.	End of Jan.	Beginning of Feb.	Mid Aug.	End of June	..	Mid Aug.

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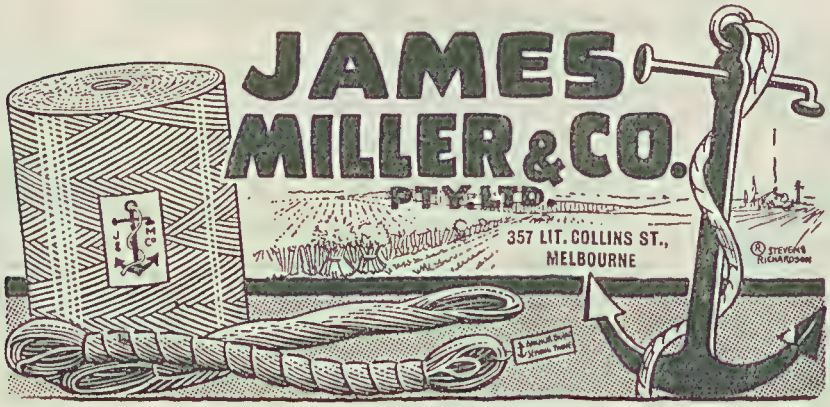

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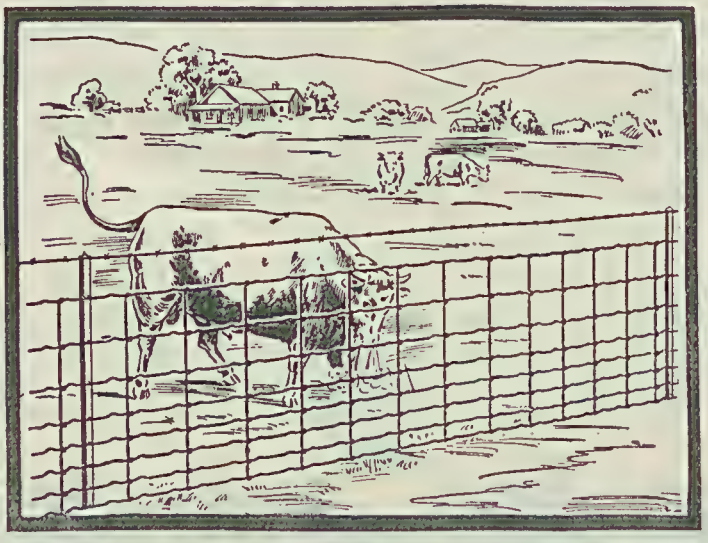

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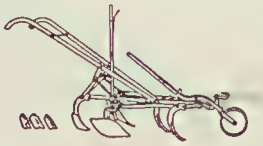

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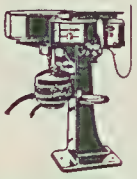

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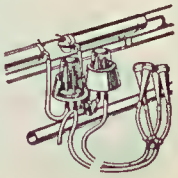

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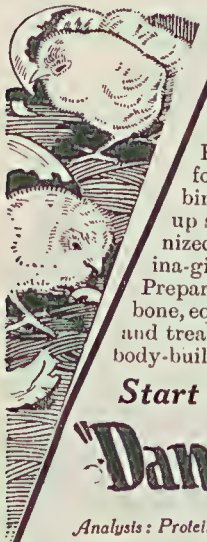

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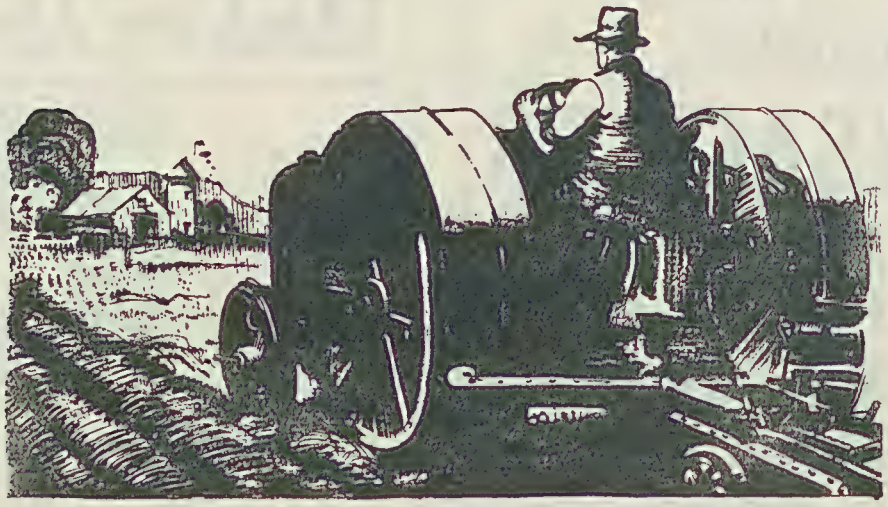

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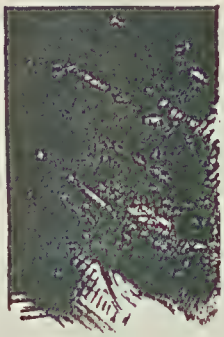

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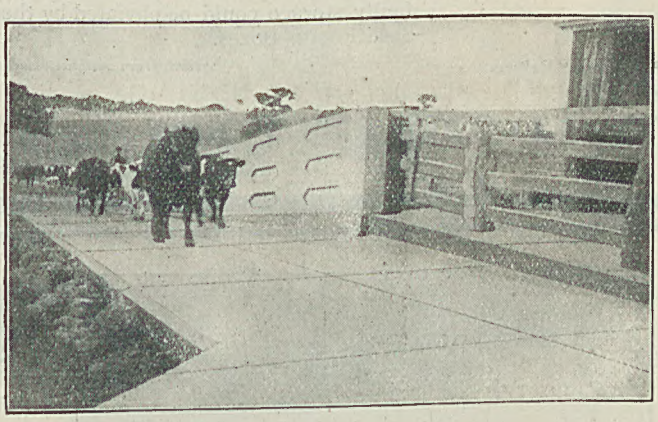

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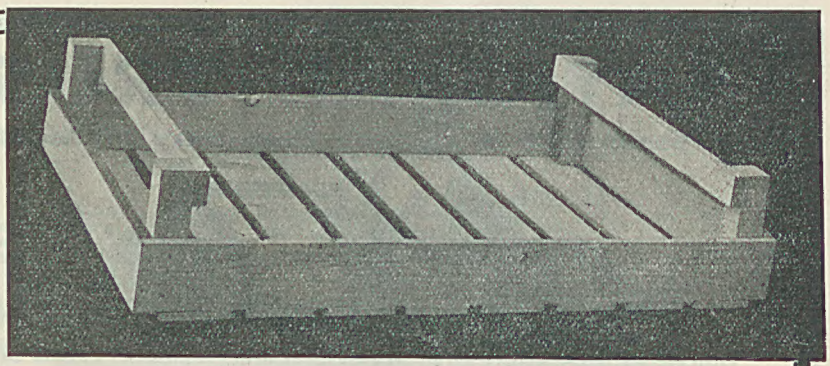

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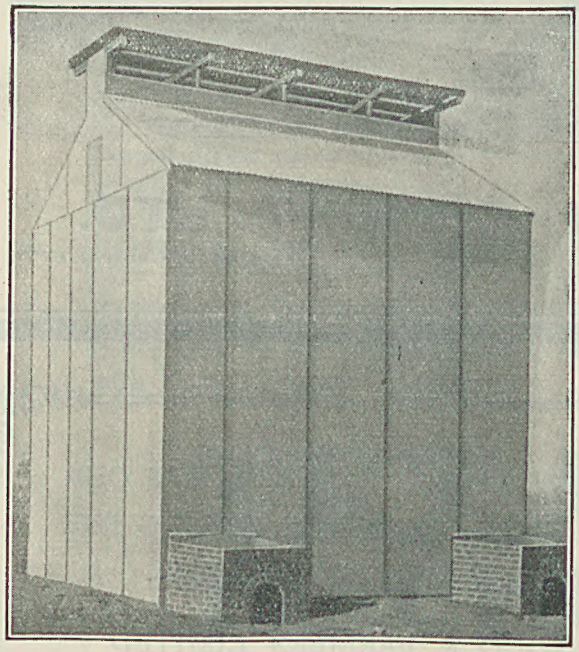

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